FIRST AERO WEEKLY IN THE WORLD

FEB 15 1951

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The AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB

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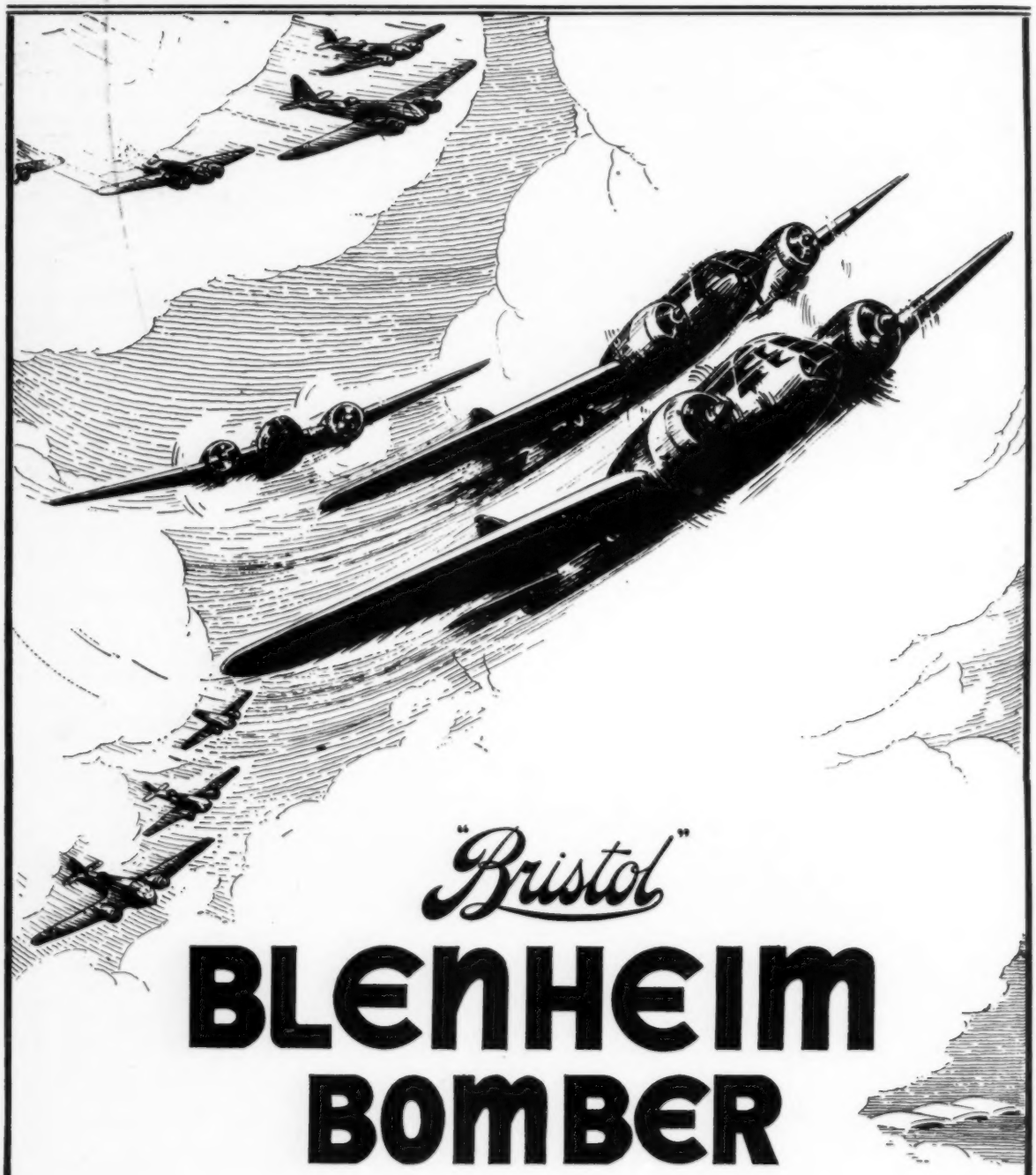

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FLIGHT
The AIRCRAFT ENGINEER

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1

Telegrams: Truditur, Sedist, London. Telephone: Waterloo 3333 (50 lines).

8-10, CORPORATION ST., COVENTRY. Telegrams: Autocar, Coventry. Telephone: Coventry 5210.

GUILDHALL BUILDINGS, NAVIGATION ST., BIRMINGHAM, 2. Telegrams: Autopress, Birmingham. Telephone: Midland 2971.

260, DEANSGATE, MANCHESTER, 3. Telegrams: Iliffe, Manchester. Telephone: Blackfriars 4412.

26B, RENFIELD ST., GLASGOW, C.2. Telegrams: Iliffe, Glasgow. Telephone: Central 4857.

SUBSCRIPTION RATES: Home and Canada: Year, £1 13 6, 6 months, 16s. 6d. 3 months, 8s. 6d. Other Countries: Year, £1 16 0. 6 months, 18s. 0d. 3 months, 9s. 0d.

No. 1571. Vol. XXXV. FEBRUARY 2, 1939 Thursdays, Price 6d.

The Outlook

Airports

UNDER the presidency of Lord Londonderry, the fifth annual Airports Conference and its Associated Airports Exhibition began yesterday morning. The conference and exhibition have been organised by the Aerodrome Owners' Association, of which Lord Londonderry is President, and yesterday some 150 delegates, including representatives of 34 municipal authorities from all parts of the British Isles were due to discuss the report of the activities of the Aerodrome Owners' Association during the past year.

Much has happened during that year, and a beginning was made with the "rationalisation" of inland air routes. To a great extent the British network of routes is influenced by the availability or otherwise of suitable airports, so that the municipalities and other owners of aerodromes, present or prospective, are very intimately concerned. This part of the conference was, somewhat naturally, held in private, but papers on subjects of general interest to all concerned in any way with airport problems are being read, and to these will be admitted all those who have been invited to the conference and exhibition which is being held at the Central Hall, Westminster.

It is to be regretted that the airports exhibition is not open to the public. That there are practical difficulties may be readily admitted. The A.O.A. has sent invitations to those who are directly interested, and doubtless it was felt that with a limited attendance there would be better opportunity to get down to brass tacks and discuss real business than if the general public had been admitted. It is a pity that it has not been found possible to make arrangements for keeping the exhibition together for a few days after the "official" duration. The public is greatly interested, and would have flocked to the exhibition in considerable numbers. Seeing for itself the tremendous trouble taken to ensure safety at airports would go a long way towards giving the public confidence in air travel, and this confidence would benefit not only the air line operators but the aerodrome owners as well.

As the public is not to be brought to the exhibition, *Flight* is bringing the exhibition to the public by reviewing in this and next week's issues the vast variety of equipment shown by 54 firms at the exhibition (and others outside it), and our readers are recommended to study carefully the pages devoted to the airports exhibition. In addition we publish this week several very informative articles by specialists in different branches of the increasingly complicated business of aerodrome establishment and operation.

The Guessing Competition

AIRCRAFT output in the different European countries has become the topic of conversation in aviation circles the world over, and scarcely a week passes but someone or other commits his ideas on the subject to print. This would not matter were it not for the fact that a figure is apt to be quoted repeatedly, and before long the figure is likely to be accepted as a fact. Now figures can be made to prove almost anything, and by themselves—without all sorts of qualifying ifs and buts—mean very little.

Nevertheless, the article which the Editor of our greatly esteemed American contemporary *Aviation* of New York, Mr. S. Paul Johnston, writes in the January issue of his journal is worth studying, not only because Mr. Paul Johnston travelled extensively in Europe towards the end of last year, but because he is a very shrewd observer and a very popular person in aviation circles in all countries. He may, therefore, be assumed to have been shown a good deal of what

was going on in all the countries he visited. We know that he was permitted to see the production of one British aircraft type from which the powers that be have hitherto thought fit to keep British technical journalists. However, that is by the way.

Mr. Paul Johnston is very careful to point out that his estimates "can be only an expression of individual opinion." After visiting Germany he comes to the conclusion that about 6,000 aeroplanes were turned out in 1938, and that by the beginning of 1940 Germany will probably be producing at the annual rate of 8,000 aircraft of all types.

Of this country Mr. Paul Johnston states that towards the latter part of 1938 British production was probably at the rate of 3,000 to 3,500 per annum, and he expects that to rise, during 1939, to a rate of 5,000 per annum.

Twice Two is Four

MEANTIME Group Capt. Payne, of *The Daily Telegraph and Morning Post*, has done a little arithmetic and has arrived at the conclusion that British aircraft output has been quadrupled during the last 12 months and is now about 400 aircraft per month.

The Air Ministry is very strict about publishing output figures. But Group Capt. Payne has very artfully used official pronouncements as a basis for his guess. Some months ago, it may be remembered, we ventured to make a little mild fun of a statement by Sir Kingsley Wood that British aircraft output had been doubled. We pointed out that twice nought was still only nought. At Birmingham last week Mr. Chamberlain also said that our output had been doubled "in the last few months." Thus, obviously, if both statements were true, the rate of output must have been quadrupled. Simple, isn't it?

The main difference between Mr. Paul Johnston's guess and Group Capt. Payne's is that the latter believes that we have already attained the rate of production which Mr. Johnston does not expect us to attain until the end of this year.

But anyway, numbers by themselves mean little. As *Flight* has pointed out more than once, ultimately it is the problem of crews rather than of aircraft which will form the bottle-neck. It cannot be assumed that because the crews are equipped with parachutes the number of casualties will be vastly smaller than the losses in aircraft. In other words, it is not safe to base our plans on the assumption that when a machine is brought down the crew will just return and collect another from stores. It would be a nice change if all these good guessers would turn to guessing about the probable output of fully trained crews.

In Detail

AND now let us return to Mr. Paul Johnston and see what are his impressions of individual British factories. He thinks the greatest output of any British type is the Bristol Company's Blenheim production, which he guesses at ten per week. The Blenheim output from the Rootes factory at Speke, when it really gets going, he thinks will be more than twice that of the Filton works. At Stockport he thinks the Fairey company is turning out two Battles per day, and by the middle of the year he guesses that the Austin factory at Longbridge will be rolling their Battles out of the back door (can it be that he did not see the famous lift, or elevator, as he would call it?) at the rate of 15 or 20 per week.

At Cricklewood Mr. Johnston thinks the Hampdens are coming through the shops at the rate of about one per day. Vickers' weekly production of the Wellington he assesses at about three or four at the end of last year, but he does not venture to express an opinion about the probable rate by the end of this year.

"Guessing again," Mr. Paul Johnston thinks that Bristol engines of various types are coming along, from all factories, at the rate of 120 per week, and 40 Rolls-Royce engines a week, with the rest of the engine industry producing 20 a week. This guess totals something like 8,000 engines per annum.

Quoting very hush-hush rumours of big four-engined bombers by Handley Page and Fairey, Mr. Johnstone says of the latter, "Very similar in outline to our Douglas D.C.4, and allegedly a transport type. It is a fairly safe bet, however, that under present conditions, such a product would have been brought into the world first as a military type from which a transport modification had been derived later. We will watch for future announcements with considerable interest." So shall *we*.

Imperial and Pan-American Airways

NEWS is to hand that Pan-American Airways have made an agreement with France for a reciprocal service across the Atlantic via the Azores and Lisbon, with Marseilles as the European base. This apparently means that Pan-Americans do not intend to fly this year by the Newfoundland-Ireland route, and in consequence of that it seems that Imperial Airways will not be allowed to fly through to New York this year. The transatlantic service which the British company contemplates will have to end at Montreal. It is a cardinal point of American air transport policy that services must be reciprocal, and that there must be no flying into United States territory unless American aircraft fly to the other country.

Of course it would be quite open for Pan-American Airways to make agreements for reciprocal services with more than one European country, but they do not possess enough suitable aircraft to make that possible at present. On the Pacific service they have two Martin Clippers at work, and with these it has not been found possible to maintain a regular weekly service to Hong Kong and back. That service needs reinforcement with more flying boats. The new transoceanic type is the Boeing 314, of which the prototype has been flown and modified, and is now ready for service. Two more are expected to be ready in a few months. This Boeing is able to use the Azores route, because it is not dependent on assisted take-off, but can lift its full load into the air on its own power. Only aircraft with this ability can at the present moment make use of the Azores, as there is no large sheltered harbour, and no land aerodrome from which a tanker landplane can take off to fuel a flying boat in the air. No tanker flying boat yet exists. It is understood that the Boeing will shortly make a demonstration flight via the Azores, perhaps carrying a few special passengers.

The European End

IF French plans materialise satisfactorily they will also be in a position to use the Azores route. Last year they sent their imposing but somewhat ancient *Lieutenant de Vaisseau Paris* to America that way. An improved version of that design should be ready for use this summer, and other large flying boats and four-engined landplanes are in course of design or construction.

Imperial Airways are tied to the Ireland-Newfound-

LOO (CONTINUED)

land route because they are relying on fuelling their new Short flying boats in the air from landplane tankers, Harrows in fact. The ice in Newfoundland will not have gone until the end of May, so Imperials cannot start their service until then. Perhaps it is those facts which account for the allegations which one hears from the States that the British are not ready and are holding up the American start, and that therefore Pan-Americans prefer to exchange services with the French.

Imperials will certainly be ready to open their service by the beginning of June. Of the four improved Empire boats which the Short firm is building for the service, *Cabot, Connemara, Caribou* and *Clyde*, three are now floating on the Medway, and *Cabot* has done a certain amount of flying. Though it seems that they will not now be allowed to fly through to New York, Imperials will none the less send them across to Newfoundland and Montreal. From there the mails for New York will have to be carried on in some other way.

At Last

FROM the very start of the C.A.G. scheme *Flight* and, in particular, our contributor "Indicator," has complained of the inadequacy of the scheme as it originally stood. On Friday of last week, at Reading, Sir Kingsley Wood gave the first authentic details of certain improvements which are to be made to the scheme.

The pupils, and those present pilots who have joined the C.A.G., will be graded into three separate classes, the first of which will be treated as forming a supplementary pilots' reserve. Those who might be eligible in cases of emergency between the ages of 18 and 30 will receive first consideration in this class, while others over this age limit, with instructional qualifications or considerable flying experience, are to receive further flying facilities, though when and how it is difficult to say.

The new grading system should, however, make all the difference to the scheme as it stands, and it is only a pity that some arrangement of this kind was not made at the very start. The fact that the new scheme follows *Flight's* ideas very closely is no consolation. We have always stressed the importance of "post-graduate" training and of making use of the amateur pilots at present in existence. The original scheme was, however, somewhat rushed into existence, and the Commissioners will now have a better idea of the available material and of the capacity of the clubs for dealing with the training work. Details of the grading system appear on page 101.

The West African Impasse

IN spite of the fact that the reason for the temporary hold-up of the British Airways West African service has been explained as being due to difficulties in flying over Spanish territory, there may still be an idea that this is not the whole story. A few weeks ago *Flight* criticised the arrangements at Cintra aerodrome, Lisbon, and some may have gained the impression that the Portuguese Government had not been entirely helpful in the negotiations.

Actually, this Government has been more than helpful and it will be remembered that, two or three years ago, such assistance was similarly offered without stint to Crilly Airways, a company which originally had the idea of running a regular service from this country to Portugal.

Presumably the inauguration of the mail service to Lisbon and, consequently, to West Africa, must await developments in Spain. General Franco has refused permission for the company to fly over his territory until his regime is officially recognised by the British Government, and any alternative involves a flight of considerable length over open sea. This would be a matter of small importance at the beginning of the journey, but it cannot be considered at the end of a non-stop run of such a length, when the fuel reserves may be dwindling.

An Appeal to Patriotism

NEVER before has such a large request been made to employers by any Government department as that just issued by the Air Ministry. It asks employers to release pilots of the R.A.F. Reserve and the R.A.F. Volunteer Reserve for six months' training with squadrons. It is really an astounding request and only the very serious state of European politics could justify it.

Many people, probably many employers, do not realise that ability to fly an aeroplane is just the mere beginning of qualifications as a useful war pilot. It is only after a man has learnt to fly well that he can start to learn all the many things which a pilot in a squadron must be able to do in time of war. These things cannot be taught properly in any school; only when serving with a squadron can a man absorb them all. If war were to break out and some squadron suffered heavy casualties in the early days its strength would be made up with pilots from one or other of these reserves. Those from the regular reserve have, of course, served with squadrons on short-service commissions, but even they would probably be a bit rusty. The Volunteer Reservists would have had no such experience, and would be very raw indeed. That squadron would be very little use until its reservists had been knocked into shape.

The Air Ministry's appeal is meant to do this knocking into shape before the bombs begin to drop and the machine guns to chatter. If the employers of the reservists are able to comply with the appeal the air defence of the country will be placed on a much better footing.

The Fall of Barcelona

SO Barcelona has fallen to General Franco, and it has fallen to his Army and not to his Air Force. The ruthless bombardment of the city did nothing to break the spirit of resistance. The chief result of the air attacks has been the practical education of the people of the Catalan capital in A.R.P. Other nations ought to learn much from a study of what has been done in Barcelona, and also in Madrid. The theory that the bomber, if used with sufficient ruthlessness, is a certain short cut to victory has now been thoroughly discredited, though that does not mean that some nations who have a liking for brutality may not some day make another effort to see if still greater ruthlessness may not produce some tangible result.

One feature of present European politics is that there are some nations which might conceivably benefit from a war in which they could obtain a quick victory, but for whom a long struggle would mean inevitable ruin. With such peoples the wish that a short cut to victory may be found is probably father to the thought that the air bomber will provide that short cut.

DIARY OF FORTHCOMING EVENTS—PAGE 123.

PLANNING for the FUTURE

The Air Ministry's Zoning and Layout Scheme for Standard Aerodromes : The Need for Obstruction-Free Approaches

SINCE the earlier days of air transport, ideas in the matter of safe and convenient aerodrome size and location have steadily changed. Not only have wing loadings and machine sizes increased, so that longer take-off and landing runs are necessary, but the ability to fly and to navigate in really bad weather has meant that the most careful attention has had to be paid to the question of removing all surrounding obstructions.

Actually, the present-day aeroplane, with a large flap area, can, if necessary, make an approach at a very steep angle if the comfort of the passengers is ignored, but such a technique of approach is particularly unsatisfactory at night or in bad visibility. Furthermore, and speaking generally, take-off runs have increased out of all proportion, and the post-take-off rate of climb has, in addition, been tending to decrease year by year. Municipalities, therefore, and others concerned with the layout of aerodromes are finding that it is necessary to buy, or at least to control, a considerable area of land in addition to the already comparatively large space taken up by the landing field itself.

It might be thought that aerodrome layouts could be standardised by reason of the fact that every machine must have a Certificate of Airworthiness and that this certificate is only given when certain take-off, climb, and landing-run figures have been accepted. These figures are quite definite ones, but it must be remembered that they are often obtained by experienced pilots in chosen weather conditions and that they do not usually apply to operations with full load in normal service.

For instance, many machines have a tendency to be somewhat lacking in lateral control near the stall, and it is normal for pilots to hold such machines down until more than ample flying speed has been obtained. For the same reason approach speeds and angles vary within big limits. During a bad-weather approach, too, the actual touch-down is often made at a very much higher speed than that of the normal stall, and the landing run, consequently, is a good deal longer.

Three years ago the Maybury Committee, in their report, enunciated the principle that, in order to ensure air service regularity in all conditions, it was necessary to arrive at some minimum standard of aerodrome dimensions, and a recommended aerodrome size and general layout was illustrated in an appendix to the report.

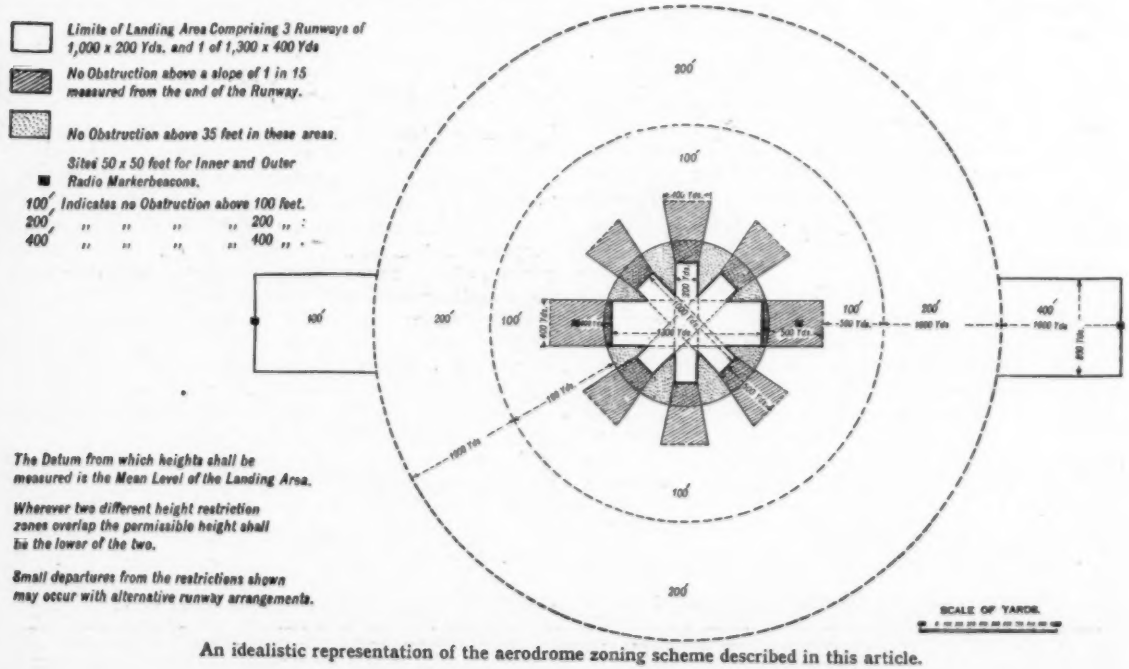
These recommendations involved not only minimum lengths of run—which were 1,000yd. in at least four directions, with a longer run for bad-visibility work—but also a system of obstruction "zoning" for the district around the aerodrome. By such means numerous approach lanes can be arranged and any unreasonable building can be prevented in certain selected areas.

Clearing the District

Only by preserving the natural approaches from the outside is it possible to prevent what amounts to a reduction of the effective dimensions of the aerodrome itself. In the same way this zoning plan allows for the layout of essential administration offices and hangars in positions where no serious obstruction can be formed by them.

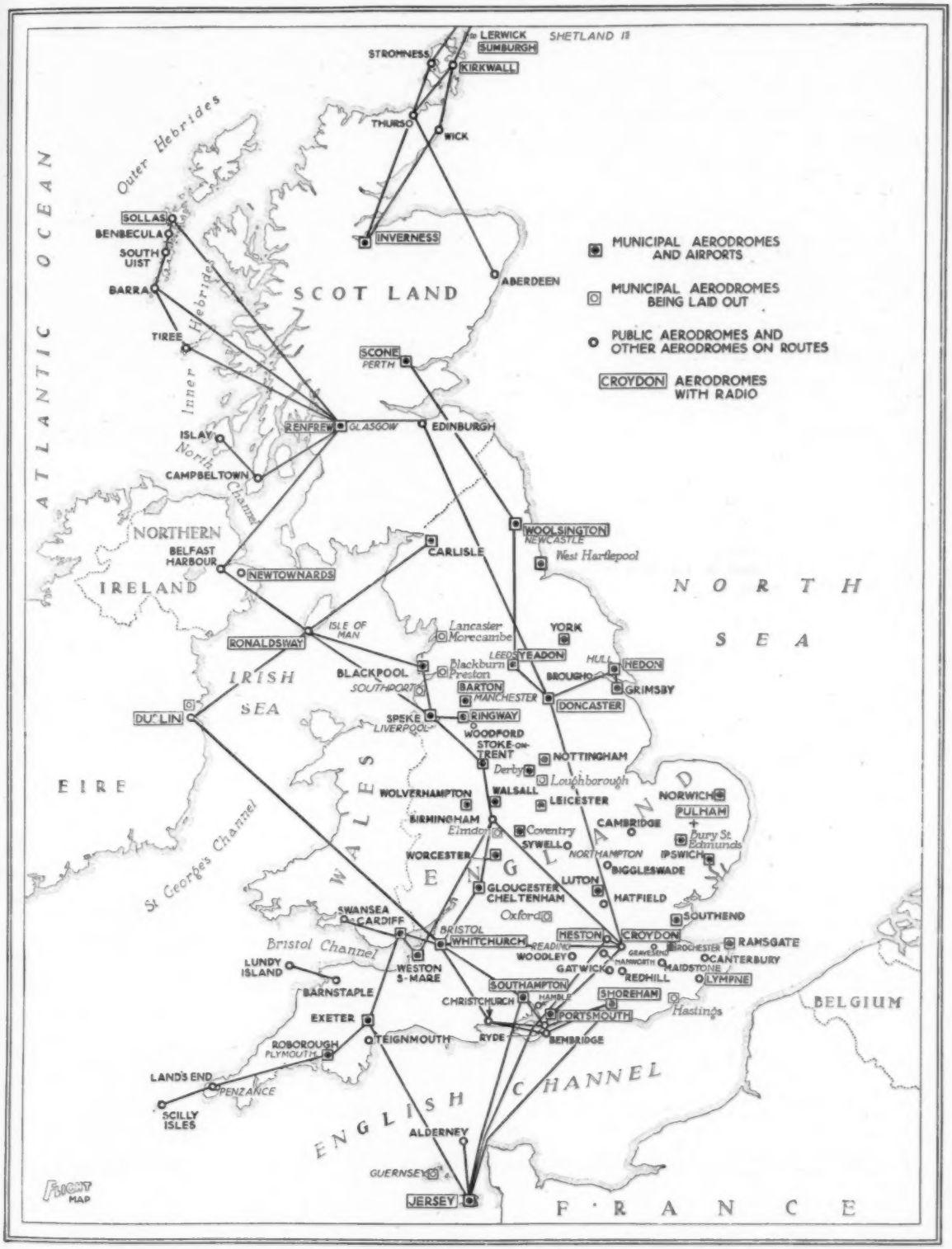
The Air Ministry, consequently, has formulated a series of principles governing aerodrome planning. In these principles it is considered that two different types of aerodrome are necessary. The first is known as a "standard" aerodrome and is intended to be suitable for the operation of regular day and night services, while the other is considered as a "secondary" aerodrome, and this would be intended for other purposes, such as school and club flying.

In the case of the first or standard aerodrome, it is suggested that the landing area should consist of not less than four runways, each of which is supposed to be at an angle not greater than forty-five degrees to its neighbour. The minimum dimensions of these runways should be 1,000yd. by 200yd. wide, while one of them, designed for low-visi-


Limits of Landing Area Comprising 3 Runways of 1,000 x 200 Yds. and 1 of 1,300 x 400 Yds
No Obstruction above a slope of 1 in 15 measured from the end of the Runway.
No Obstruction above 35 feet in these areas.
Sites 50 x 50 feet for Inner and Outer Radio Markerbeacons.
100′ Indicates no Obstruction above 100 feet.
200′ " " " " 200 " :
400′ " " " " 400 " .
The Datum from which heights shall be measured is the Mean Level of the Landing Area.
Wherever two different height restriction zones overlap the permissible height shall be the lower of the two.
Small departures from the restrictions shown may occur with alternative runway arrangements.
SCALE OF YARDS.

An idealistic representation of the aerodrome zoning scheme described in this article.

INTERNAL COMMUNICATIONS



The basic airline system and its relation to the disposition of present and future municipal aerodromes. Only the winter services and those which have been in operation during the past few years are shown. The concentration of routes in areas where surface transport services are slow or inadequate is noteworthy. Work at several of the newer municipal airports has been pressed ahead because of Reserve School or manufacturers' requirements.

bility approaches and take-offs, should be 1,300yd. long and 400yd. wide. Additionally, a strip of ground 50yd. wide and considered as a "neutral" area should adjoin the sides of each. Needless to say, the disposition of these runways must usually be dictated by local conditions.

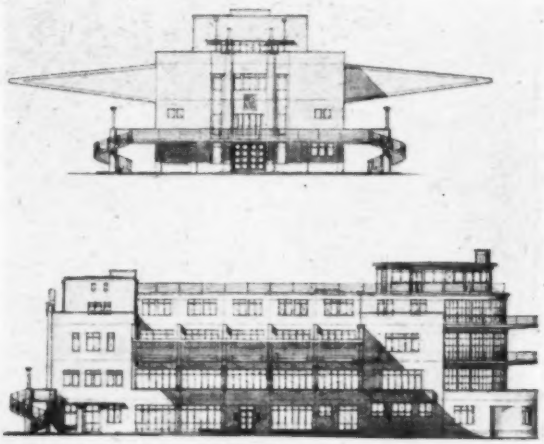
In an air space extending for a distance of 500yd. beyond the end of each runway any obstructions should be kept down in height to allow a safe glide at a minimum angle of 1 in 15. Within a circular area with a radius 175yd. greater than that which would just include the landing area, the maximum permissible height of any obstruction should be 35ft.—or less, according to the special circumstances. Between the perimeter of this area and that of another circle with a radius which is 1,000yd. greater than that of the inner circle, the maximum permissible height of any obstruction should be 100ft., while the circular outer limit of the zoning system, as a whole, has a radius of an additional 1,000yd. Within this entire area, again, the maximum height of obstructions should not exceed 200ft.

Finally, restrictions should normally be applied to two rectangular areas beyond the outer zoning circle, these being in line with each end of the bad-visibility runway. In these areas, which are 1,000yd. deep and 800yd. wide, obstructions height should be kept down to 400ft., so that the pilot approaching on a series of bearings or on an ultra-short-wave beacon will have an additional 1,000yd. of known terrain—making 3,000yd. in all before he has reached the inner marker beacon.

In the case of secondary aerodromes the suggested requirements are, of course, very much less severe, and, consequently, expensive to the landing-ground owner. When no runway system is used it is suggested that obstructions should not be erected within 1,000yd. of the aerodrome boundary to make it necessary to approach at an angle steeper than 1 in 15, and none, also, should be erected more than 200ft. higher than the landing area within a distance of 2,000yd. of the boundary. If a runway system is provided an air space of 1,000yd. long at the end run must, in the same way, have no obstructions making the necessary approach slope steeper than 1 in 15; no building or trees higher than 100ft. should lie within 500yd. of the aerodrome boundary, and none higher than 200ft. within 2,000yd. of the boundary.

This zoning and aerodrome layout is, of course, merely a recommendation, but it is unlikely that machines in future (at least for some time to come) will improve in their approach and take-off characteristics, and it is as well for those planning aerodromes to abide, so far as possible, by the recommendations. In this country, particularly, a number of cases can be given where no attempt has been made to restrict building operations in or near the aerodrome boundary, and the result has been that an otherwise adequate aerodrome has been made much less ueful.

Croydon is a case in point, and it may be difficult for the many who criticise this airport to realise that the runs provided there vary between 1,180yd. and 1,360yd. in length. Such runs would be more than ample were it not for the fact that houses, chimneys, overhead cables, and so forth have meant that the touch-down in practically every direction must be made many hundred yards from the actual boundary. With conditions as they are, some form of serious planning must be applied to the construction of every aerodrome.



UNCONVENTIONALITY AT ELMDON: One of the most interesting examples of airport building architecture is to be seen nearing completion at the new Birmingham airport. By the use of balanced cantilever canopies, which largely determine the design of the main building, provision is made for covered loading. The building itself is a four-storied one with plenty of accommodation for the general public as well as for the personnel, and the size of the whole may be gathered from the fact that each canopy has a fifty-foot overhang. A similar idea, though on a much larger scale, is to be seen at Tempelhof, Berlin, though in this case the hangars and workshops are part and parcel of the main design. The Elmdon scheme, so far as the aerodrome is concerned, is being carried out in two stages, the initial scheme providing runways varying between 1,100 and 1,200yd. and the final scheme giving a maximum bad-weather runway length of 1,500yd. The zoning plan as applied to Elmdon airport is illustrated on page 112.

SIR KINGSLEY WOOD at READING

The Secretary of State Opens New Phillips and Powis Factory : Statement on Production of Wooden Aircraft

Sir Kingsley Wood with Mr. F. G. Miles prior to flying in a Monarch.

AS the home of the Magister *ab initio* trainer (already in large-scale use) and the Master high-speed advanced trainer now in production for the Royal Air Force, the Phillips and Powis works at Reading are of extreme importance in the scheme of R.A.F. expansion. It was fitting therefore, that an extension to the works should be opened last week by Sir Kingsley Wood, Secretary of State for Air.

Sir Kingsley Wood said that Phillips and Powis had a high reputation for efficient and fast training machines. They were in considerable production and he congratulated them in being in advance of their delivery programme. Extensions to the factory had been authorised at the cost of a quarter of a million pounds and had been completed in excellent time.

Referring to the firm's association with the building of wooden aircraft, Sir Kingsley Wood said that the Air Ministry has taken a number of important steps to broaden the basis of aircraft production, including the further development of wooden construction. Eight firms were now engaged on the production of considerable numbers of wooden or composite aircraft. A production order had also been given for a general service aircraft of composite construction and a large order has been placed with Phillips and Powis for the production of single-engined aircraft, for Service training, of all-wooden construction.

Speaking generally of aircraft production Sir Kingsley said that we had now overcome many of our chief difficulties and that production was gaining considerable momentum. The monthly rate of production had been doubled last year and he had good grounds for believing that this year it would be trebled, and that in the rate of production and in the quality of the machines we should have a record twelve months.

Important references were made to the Civil Air Guard Scheme, but these are dealt with elsewhere in this issue.

After Sir Kingsley Wood had impressed his signature in a mould containing moist concrete (it being the intention that the block shall later be built into one of the factory walls) he formally declared the works open and started up the machinery by operating a master switch. Subsequently an employee presented him with a silver cigarette casket surmounted by a model of the Miles Master.

Sir Kingsley Wood, accompanied by his Parliamentary Secretary, Sir Edward Campbell, M.P., the directors of Phillips and Powis Aircraft, Ltd. (Mr. A. F. Sidgreaves, Chairman, Mr. F. G. Miles and Lt.-Col. Ormonde Darby), Air Marshal Sir Wilfrid R. Freeman, K.C.B., D.S.O., M.C., Air Member for Development and Production, and Sir Charles Bruce Gardner, Chairman of the Society of British Aircraft Constructors, afterwards made a tour of the works. Subsequently the party visited the Experimental Department, where some aircraft of unusual interest are being assembled.

After inspecting No. 8 Elementary and Reserve Flying Training School, Sir Kingsley Wood flew in a Miles Monarch with Mr. F. G. Miles, and after landing lunched with the directors in the directors' luncheon room.

It is regrettable that Sir Kingsley Wood was unable to see a Master perform in the air, but the prototype machine is undergoing modifications to the tail. The Master may be considered as a development of the Rolls-Royce-Kestrel-engined trainer produced during 1937. This machine, with a Kestrel XVI engine, has a top speed of nearly 300 m.p.h., but the lower-powered Kestrel XXX installed in the Master reduces the speed to a shade under 270 m.p.h.

Scottish Aircraft Exhibition Plans

GLASGOW is to see (weather permitting) a fly-past by R.A.F. and civil aircraft when the City's Aircraft Exhibition is formally opened in the McLellan Galleries by the Air Minister on February 13.

Sir Kingsley Wood, who will be accompanied by several of the permanent chiefs of the Air Ministry Departments, will fly north on Sunday, February 12, where he will be received by Lord Provost J. J. Dollan and members of the Corporation.

On the following day Sir Kingsley Wood will visit the Blackburn aircraft factory at Dumbarton and, later, will have a discussion regarding the question of providing additional Air Ministry contracts for local firms.

Not the least spectacular feature of the other Scottish Aircraft Exhibition—in Edinburgh from February 11 to 25, will be the A.A. demonstrations staged by the 4/5th (Queen's Edinburgh) Royal Scots (52nd Searchlight) Regiment and the 228th (Edinburgh) Anti-aircraft Battery.

The Aircraft Exhibition will be held in the Waverley Market. From the Royal Scottish Museum there will be exhibits recalling the experiments of such pioneers as the Wright Brothers and Bleriot, and the G.P.O. will stage an air-mail display. The Air Ministry's part in the exhibition will include two complete fighters. It is understood that three firms, Armstrong-Whitworth, Bristol and Rolls-Royce, will exhibit at each show.

Admission will be free to the public each afternoon and evening at both exhibitions, the forenoons being reserved for manufacturers and others wishing to study exactly the Ministry's requirements before tendering for work. This, actually, is the primary object of both exhibitions.

Air-Mail Souvenirs on Show

AIR transport was well represented in both "educational" and "commercial" sections of the third London Stamp Exhibition, which was held last week at the Central Hall, Westminster.

On the commercial side, one of the largest stands—that of A. Phillips, of Newport, Mon—was devoted entirely to air-mail covers and similar souvenirs, while among educational exhibits the entrance to the exhibition was flanked by two frames containing portions of London and Manchester daily newspapers flown across the Atlantic last summer.

These newspapers bear English postmarks of July 20 and Canadian or American marks of the following day, thus summarising for posterity the first transatlantic flight of *Mercury*, upper component of the Short-Mayo composite aircraft. They were lent for the exhibition by Wm. Dawson and Sons, Ltd.

Pages from the private air-mail collection of Mr. A. Phillips were described by the self-explanatory phrase, "Great records of great records." Mr. Phillips showed not only flown envelopes, but relevant photographs and documents in his collection ; a cover carried by Mr. H. L. Brook on his record Australia-London trip is accompanied by a complete cutting of *Flight's* report on that event.

Other exhibits included pages from a collection of stamps illustrating recognisable types of aircraft (marred by one or two surprising errors), and the organisers paid tribute to philatelists' interest in aviation by issuing six souvenir "stamps" illustrating the Lockheed machines of British Airways. They were printed by Harrison and Sons, Ltd., the postage-stamp printers.

The frontage of new factory at Southampton Airport.

SOUTHAMPTON SEND-OFF

Ceremonial Inauguration of Cunliffe-Owen Works

FOLLOWING soon after successful initial test flights of the Cunliffe-Owen "Flying Wing" transport, the constructors' big new factory at Southampton Airport was formally opened on Wednesday of last week by the Mayor of Southampton.

After the opening ceremony—which, owing to heavy rain, became an indoor affair rather than one on the threshold—visitors were shown round the main factory. Two main impressions of the workshops gained were, first, their vast size (the total area is 110,000 sq. ft.), and, secondly, the extreme care given to natural and artificial lighting.

It is understood that a considerable quantity of sub-contract work will be done in the new factory in addition to further production of the firm's own aircraft designs. The offices, which had not yet received their final coat of paint, were remarkably large and the future occupants should work under almost ideal conditions. In the office of the managing director (Mr. R. M. Hoyes) were drawings of projected designs for Cunliffe-Owen aircraft and a series of models which portrayed two-, three- and four-engined civil types, together with one model of a twin-engined military aircraft which appeared to have a shell gun mounted in a rotating turret fitted in a single tail boom aft of the wing and a fixed shell gun firing forward.

Situated on the first floor are the drawing offices, in which, again, special attention has again been given to lighting. These offices, at the moment only partly filled, will allow a very large staff to be installed. Artificial lighting is by large angle lamps placed in the ceiling on the left-hand side and slightly forward of the board.

To cater for the staff and workmen a very large kitchen and canteen has been provided. The layout of the kitchen is exceptional. A noteworthy inclusion in the kitchen equipment is a large refrigerating room, an item which is possibly unique in aircraft factory canteens.

In No. 2a hangar at the airport was the "Flying Wing" monoplane. The cabin equipment had not yet been installed but the aircraft was open for structural inspection. It is understood that a few modifications are intended, one being the replacement of the aft metal fairing to the pilot's cockpit by a transparent enclosure. The machine was described in detail in *Flight* of December 22, 1938.

In the hangar, incidentally, centre sections for a well-known Service type were in production, the jigs having a raised flooring for working on the centre section in a vertical position.

During a few moments of fine weather the transport was wheeled out into a space between the hangars for photography, and the two Perseus engines were started for the benefit of the cinematographers. A lull in the proceedings was filled in with an impromptu display by a Kay gyroplane—another product of the growing industry at Southampton.

Sir Hugo Cunliffe-Owen, in his speech at the opening ceremony, said that considering the short time in which the factory was erected, he felt that considerable praise was due to Sir Robert MacAlpine and Sons, who had worked so rapidly and in such close co-operation with his company. Sir Hugo felt that the "Flying Wing" had great promise. He hoped that the visitors to the shops would appreciate the work which had been commenced.

The Mayor of Southampton, Councillor A. H. Powdrill, said that he was very pleased that he had persuaded Sir Cunliffe-Owen to build his works at Southampton Airport and he felt that the factory was a worthy addition to the very progressive City of Southampton. He, too, thought that Sir Robert MacAlpine and Sons had created a very fine factory, and it was important to note that the building had been erected in only sixty-four working days, of which twenty-one were hampered by frost.

It was anticipated that when the factory was in full production there would be over 1,800 employees. After wishing the company success the Mayor cut a green and white ribbon tied between two pillars and declared the factory open.

Mr. A. H. R. Fedden's Lecture

A CHANGE has been made in the venue of the lecture on "Sleeve-valve Engines" to be given by Mr. A. H. R. Fedden on Tuesday, February 7, at the joint meeting of the Royal Aeronautical Society and the Institution of Automobile engineers.

Such a large attendance of members of both societies and of visitors is expected that it has been decided to hold the lecture at the usual R.Ae.S. venue—the Hall of the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1. The meeting will be held at the time already announced, i.e., 7.45 p.m.

Empire Air Day Poster Competition

A PRIZE of 25 guineas for the best design of a poster advertising Empire Air Day is offered by the Air League of the British Empire.

Entries, which must be suitable for reproduction in four or five colours and various sizes, must be submitted in double-crown size and reach the offices of the League at Maxwell House, Arundel Street, London, W.C.2, by February 10. The poster must incorporate the following information:—

(1) The date of Empire Air Day (Saturday, May 20, 1939).

(2) That Empire Air Day is organised by the Air League of the British Empire in conjunction with the Air Ministry.

(3) That R.A.F. and civil aerodromes throughout the country will be open to the public from 2 p.m. until dusk.

(4) That admission will be 1s. for adults and 3d. for children.

(5) That flying displays will be given and visitors allowed to inspect aircraft on the ground, workshops, etc.

Competitors should leave space on the poster for local aerodromes to overprint details of their individual arrangements. The competition is open to all, including R.A.F. personnel.

Lady Longmore as A.D.C.C. Unit Secretary

THE Air League of the British Empire announces the registration of No. 47 Air Defence Cadet Squadron at Grantham. The Mayor, Councillor Stanley Foster, is president of the organising committee. The chairman is Capt. Philip Grinling, M.C., and the hon. secretary is Lady Longmore, wife of Air Marshal Sir Arthur Longmore. Lady Longmore is the first woman organiser to join a local committee of the Air Defence Cadet Corps.

A sum of £150 has been subscribed in one week by townspeople and nearby residents towards the establishment of the Squadron.

FROM the CLUBS and SCHOOLS

Flying and Social Activities : C.A.G. News

LONDON.

FOR the week ended January 28 a total of 50 hr. 50 min. flying was logged. Messrs. A. E. H. Cosham and L. W. Darley made their first solo flights.

PLYMOUTH AND DISTRICT.

Only 2½ days out of the last week were suitable for instruction, and 21 hours were flown.

MARSHALL'S.

The total flying put in during the week ended January 28 amounted to 67 hr. 50 min., and Messrs. Melville and Walters completed their "A" licence tests.

THANET.

Flying totalled 28 hours, but was mainly restricted to experienced pupils owing to squally winds, which reached gale force at times. Mr. A. Gifford has passed the tests for his "A" licence.

SOUTH COAST.

In common with other flying clubs all over the country, the extremely bad weather allowed only a small total of flying hours for last week. A dinner-jacket dance is to be held at the club on Saturday, February 18.

BARTON (BEDS).

Flying hours were somewhat decreased owing to snow, but the lectures have been well attended. Social Sunday evenings have recommenced. Miss Madge Grimmer made her first solo and Mr. W. A. Inskip completed his "A" licence tests.

WESTON.

The first instalment of C.A.G. pilots is reaching maturity, and Messrs. A. C. Dennis, N. Rogers, R. T. Styles and J. S. Meaker all made their first solo flights in the 3½ flying days available during last week. Sixteen hours in all were flown.

WITNEY AND OXFORD.

The weather has been bad and only 92 hr. 5 min. were flown during January up to the 29th. First solos were made by Messrs. J. D. Doe and T. E. Worth, and Mr. D. Geddes passed his "A" licence tests. A third Swallow has been added to the fleet.

PORTSMOUTH.

During the twenty-eight days following January 1, 44 hr. 15 min. C.A.G. flying has been done and 45 members are now flying solo. Fifteen members have qualified for their "A" licences and it is hoped that several others will soon do so. Club flying amounted to 28 hr. 55 min. in the same period.

CINQUE PORTS.

Another C.A.G. member who has obtained his "A" licence is Mr. J. E. Swift. A long-distance flight—from Lympne to Aden—was made by Flt. Lt. Smith in his 1928 Salmson Klemm. A Swallow belonging to Viscount Gort has been taken to Lympne for C. of A. and modification. Tickets are now obtainable for the annual dinner and dance on Friday, February 17.

BROOKLANDS.

During another week of mixed weather, Mr. Gerald Sumner went solo and Mr. L. R. Hiscocks passed his height test during the fair periods. The programme for February's activities offers an aerobatic display by Ken Waller next Sunday; a treasure hunt in cars on February 12; the first handicap competition of the season to be flown off in the form of a map-reading test on February 19; and on Saturday, the 25th, the annual general meeting.

IPSWICH.

Thirty hours were flown, although wind and rain squalls prevented flying on all but 2½ days during the week ended January 24. Messrs. W. Barnard and A. A. Halliday made their first solo flights.

YAPTON.

C.A.G. members, of whom there are now 64 flying, put in 64 hr. 15 min. flying during the first four weeks in January. Fourteen members are already flying solo and three more have qualified for their "A" licences.

EXETER.

Thirteen hours' were flown on the 2½ days available last week. Forthcoming fixtures include a squash rackets match with the Seaton Golf Club on February 4 and the club "Eating-in" night on February 10, when members will consume an original Continental dinner.

YORKSHIRE.

During January a total of 114 hr. 50 min. was flown, 53 hr. 30 min. of which were put in last week. A dance, which went off very well indeed, was held in the clubhouse on January 21. The club now has a fleet of fourteen aircraft with six instructors, and it is hoped to start lectures for the C.A.G. members very shortly.

NORFOLK AND NORWICH.

The Norfolk and Norwich Club has just taken delivery of a further Gipsy I Moth. A slight improvement in the weather resulted in an increase, though small, in the flying total, and one first solo was made. In the gliding section elementary training was given by Mr. Firmin, while other members made flights in the nacelled Dagling; the H.17 has also been in the air after its recent overhaul.

HERTS AND ESSEX.

Rough weather conditions included a fall of snow and were responsible for a drop in flying times, 73½ hours being logged for the fortnight ended January 26. Incidentally, though only seven days were suitable for flying, five first solos were accomplished, by Messrs. R. H. Walling, F. E. Johnson, E. W. Curtis, E. P. R. Cornish and C. Reeves. Miss M. E. Stuart completed her "A" licence tests.

ROMFORD.

Last week-end Capt. A. H. Balfour, Under-Secretary of State for Air, visited the club at Maylands to inspect Civil Air Guard members, two squadrons of the Air Defence Corps and the National Women's Air Reserve.

The adverse weather conditions last week still continue to affect flying and hardly any time was logged. A lot of hard work, however, is being put in in the lecture rooms by the C.A.G., N.W.A.R. and A.D.C.C preparatory to the return of more suitable flying weather

NORTH BRITISH.

Only 4 hr. 40 min. were flown by Civil Air Guard members during the week ended January 20. Owing to the soft state of the aerodrome at Dyce, there was no flying at all on four days.

Speaking at the annual dinner and dance, held at the Caledonian Hotel on January 26, Mr. E. L. Gandar Dower made some remarks of special interest to the C.A.G. section when he discussed the forthcoming extension of the C.A.G. scheme to embrace training on Service types. He also announced the establishment of a Reserve school at Dyce.

THE NEW C.A.G.

THE Commissioners of the Civil Air Guard and the Air Ministry have now agreed that further steps may be taken to fit the Civil Air Guard organisation for service in case of emergency. It is proposed that all existing and future "A" licencees with suitable qualifications should be grouped into three separate classes.

The first of these, which will be known as Class "A," will include two sections. One will be for men between the ages of 18 and 30 who might be eligible as Service pilots in case of war, and these will be examined by travelling R.A.F. medical boards. In addition to their ten hours of normal C.A.G. flying, they will receive advanced training for which a further subsidy will be paid to the clubs concerned, and they will then be tested for their flying abilities by the R.A.F. authorities. The second section of this first class will include all men over the age of 30 who have instructional qualifications or considerable flying experience and who might be suitable either as Service pilots or instructors in case of war. These will also be offered special training facilities, but no tests or medical examinations will be made—at any rate, for the time being.

The second class, "B," includes men up to 40 years of age who would not be eligible, on medical or other grounds, for "A," but who might be able to undertake other Service flying duties, such as those carried out by observers, wireless operators and air gunners. Special training in this class will take the form of lectures covering the particular duties for which the member may be selected—these to be carried out where possible in connection with the R.A.F.V.R. The applicants will be tested, but no further medical examination will be required.

The third class, "C," will include men who do not fall into either of the other classes, as well as all women who might be suitable according to the experience as ferry or ambulance pilots and for general communication duties. In this case no additional instruction will be given, but members will be noted by the Commissioners for their flying records and general efficiency.

THE ROYAL AERO CLUB

News and Official Notices for the Week Ended January 28

Super C.A.G.s

FINAL obstacles to full-speed progress with the extended Civil Air Guard scheme were removed last week, when a working arrangement, enabling full advantage to be taken of the abilities of all C.A.G. members, was arrived at between representatives of the General Council of Association Light Aeroplane Clubs and of the Air Ministry.

It was decided at a meeting held at Ariel House on Thursday, January 26, that special "starred" categories for picked members should be established.

As already announced in the Air Ministry's statement, these categories will be A1, A2, B and C. A1 will be open to men of ages 18 to 30 who might be eligible as service pilots in case of war.

All the negotiations with the Air Ministry leading up to development were undertaken by the General Council, in close collaboration with the Commissioners of the Civil Air Guard.

Britannia Trophy Award

THE Britannia Trophy has been awarded for the year 1938 to Sqn. Ldr. R. Kellett as the leader of the Royal Air Force flight which in November, 1938, successfully attacked the world's non-stop distance-in-a-straight-line record.

Given annually to the British pilot who is adjudged to have accomplished the most meritorious performance in the air during the year, the Britannia Trophy was first awarded in 1913 to Capt. C. A. H. Longcroft (now A.V.-M. Sir Charles Longcroft). It is a silver statuette about 2ft. high and it was presented to the Royal Aero Club by Capt. H. Barber.

Germany Aims High

FIRING practice with danger zones extending up to sometimes undetermined heights is proceeding in nearly forty different areas in Germany. The areas have been defined in recent German broadcasts and Notices to Airmen. They include areas close to Lüneburg (40 km. south-east of Hamburg), Gustrow, Blaubeuren, Eisenach, Nuremberg, Mindelheim (47 km. south-west of Augsberg), Landau, Grunberg and Logau. The danger areas are defined as anything from 500 m. above the ground at places like Lüneburg and Gustrow to 3,600 m. at Garmisch, which is 81 km. from Munich. In other areas no definite safety height is given, and no ground signals will be made. Pilots are advised to keep a[illegible]st 5 km. away from the defined areas as no responsibility f[illegible]ccidents in the danger areas is admitted.

An important point about this intensive firing practice which is now going on in many parts of Germany is that in future notices will not necessarily be issued giving particulars of dates and times. In consequence, air tourists should ensure that their flying maps are up to date if they contemplate extensive journeys over German territory.

Adastral Information

A LIST of all registered flying clubs and air organisations in this country is kept at the Air Ministry Information Bureau, which is now at Adastral House, Kingsway, London, W.C.2. As already recorded in *Flight*, this is a development of the Civil Aviation Information Bureau, formerly at Ariel House.

Both civil and military questions are answered in the new Information Bureau. Its telephone number remains Temple Bar 3553.

True Swedish Hospitality

A CORDIAL standing invitation to members of the Royal Aero Club visiting Stockholm is issued by the Swedish Royal Aero Club (Kungl. Svenska Aerokubben).

Visitors who present a letter of introduction from the Royal Aero Club are assured of a hearty welcome and will be accommodated with bedrooms and general facilities.

Help for Charter Work

PRIVATE charter work will be considerably facilitated by the introduction of a new form of Customs guarantee. It is the *Acquit-à-Caution*, which performs the same function for a charter aircraft as the Carnet de Passages en Douanes does for a private aircraft.

The *Acquit-à-Caution* applies only to flights to France and is the outcome of an agreement recently reached between the Royal Aero Club and the Aero Club de France.

In form it is a green-covered tear-off booklet containing fifty pages, each divided into the *Acquit* in duplicate and a counterfoil. The book costs £2 10s., which works out at 1s. per journey. Each *Acquit* is valid for three months. The necessary financial guarantee to the French Government, through the Aero Club de France, has been given by the Royal Aero Club. The booklets will be available shortly at the Royal Aero Club.

Air News

INDIA.—A new civil landing ground has been opened at *Ahmedabad*. The old R.A.F. aerodrome at *Quetta* has been abandoned and a new one taken into use. Permission is required for its use by civil aircraft.

POLAND.—Flight is prohibited over the *Kabaki* forest near Warsaw.

Aviators' Certificates

No.	Name.	Club or School.	Date.
16,906	Thomas Walter Wild	Coventry Aeroplane Club	30.12.38
16,907	Harry James Tutt	Malling Aero Club ...	14.11.38
16,908	Hugh Cecil Rose	Malling Aero Club ...	12. 1.39
16,909	Howard Woodrow Coxon ...	Airwork Flying Club ...	14. 1.39
16,910	Wilfred John Lionel Watts ...	Southend Flying Club ...	6. 1.39
16,911	Anthony Ponder	Tollerton Aero Club ...	13. 1.39
16,912	John Trevor Marshall	Tollerton Aero Club ...	17. 1.39
16,913	Alfred Clement Heatly Maguire	Coventry Aeroplane Club	29.12.38
16,914	Sidney Norman Bourne	Coventry Aeroplane Club	20. 1.39
16,915	Stanley Herbert Blacklocks ...	Cinque Ports Flying Club	13. 1.39
16,916	Richard George Parnell	Cinque Ports Flying Club	13. 1.39
16,917	Thomas Lee Rea Hardy	Cotswold Aero Club ...	21. 1.39
16,918	Patrick Wilfred Wells	Cotswold Aero Club ...	17.12.38
16,919	Eric George Louis Thompson ...	Air Service Training, Ltd., Hamble.	15.12.38
16,920	George Aubrey Becker	Air Service Training, Ltd., Hamble.	17.12.38
16,921	Stanley Vaughan	Redhill Flying Club ...	16. 1.39
16,922	Rachael Janet Owen	Cambridge Aero Club ...	19.11.38
16,923	Kenneth William Pawson ...	Hull Aero Club	27.12.38
16,924	Joan Elizabeth Goodall	Cinque Ports Flying Club	22. 1.39
16,925	Ellis Taylor Collins	Malling Aero Club ...	22. 1.39
16,926	Harry Bell	Hull Aero Club	1. 1.39
16,927	John Kenneth Haviland ...	Tollerton Aero Club ...	20. 1.39
16,928	John William Ramshaw	Hull Aero Club	15. 1.39
16,929	Millicent Evelyn Stuart	Herts and Essex Aero Club	24. 1.39
16,930	Howard Edward Maxmillian Wise.	Liverpool and Dist. Aero Club.	5. 1.39
16,931	Mary Josephine Corbett-Lowe ...	Liverpool and Dist. Aero Club.	19. 1.39
16,932	Sydney Maurice Baker	Ipswich Aero Club ...	22. 1.39
16,933	Thomas Kenneth Lee	Ipswich Aero Club ...	22. 1.39
16,934	Alfred Driessen	Ipswich Aero Club ...	24. 1.39
16,935	Frederick Arthur Wright ...	Ipswich Aero Club ...	20. 1.39
16,936	Robert Francis Stevens	Kent Flying Club ...	22. 1.39
16,937	Frank Albert Simpson	County Flying Club ...	24. 1.39
16,938	Harold Bertie Robertson ...	No. 34 E. and R.F.T.S., Southend.	25. 1.39
16,939	William Alfred Inskip	Bedford Aero Club ...	24. 1.39
16,940	Donald Vivian Woolf	Cotswold Aero Club ...	20. 1.39
16,941	Alexander Scott	Cotswold Aero Club ...	2.12.38
16,942	William Ulric Bedford	Eastbourne Flying Club ...	17. 1.39
16,943	Walter McDermott	Liverpool and Dist. Aero Club.	20. 1.39
16,944	Kenneth Husband	Liverpool and Dist. Aero Club.	22. 1.39

A Lecture on Gliding

MR. ROBERT KRONFELD, instructor-manager of the Oxford University and City Gliding Club, is to lecture on "Gliding and Soaring" at the Royal Society of Arts, John Street, Adelphi, London, W.C.2, at 8.15 p.m., on Wednesday, February 8.

The lecture will be illustrated by slides and a film, and Lord Sempill will preside. Application for tickets should be made to the Secretary, Royal Society of Arts, John Street, Adelphi, London, W.C.2.

Buildings "designed for expansion"—the Ipswich Airport block, with squash courts in the foreground

Laying-out Airport Buildings with a View to Simple and Economical Future Enlargement

By ROBERT HENNING and ANTHONY M. CHITTY
(*Architects, A.R.I.B.A.*)

DESIGN for EXPANSION

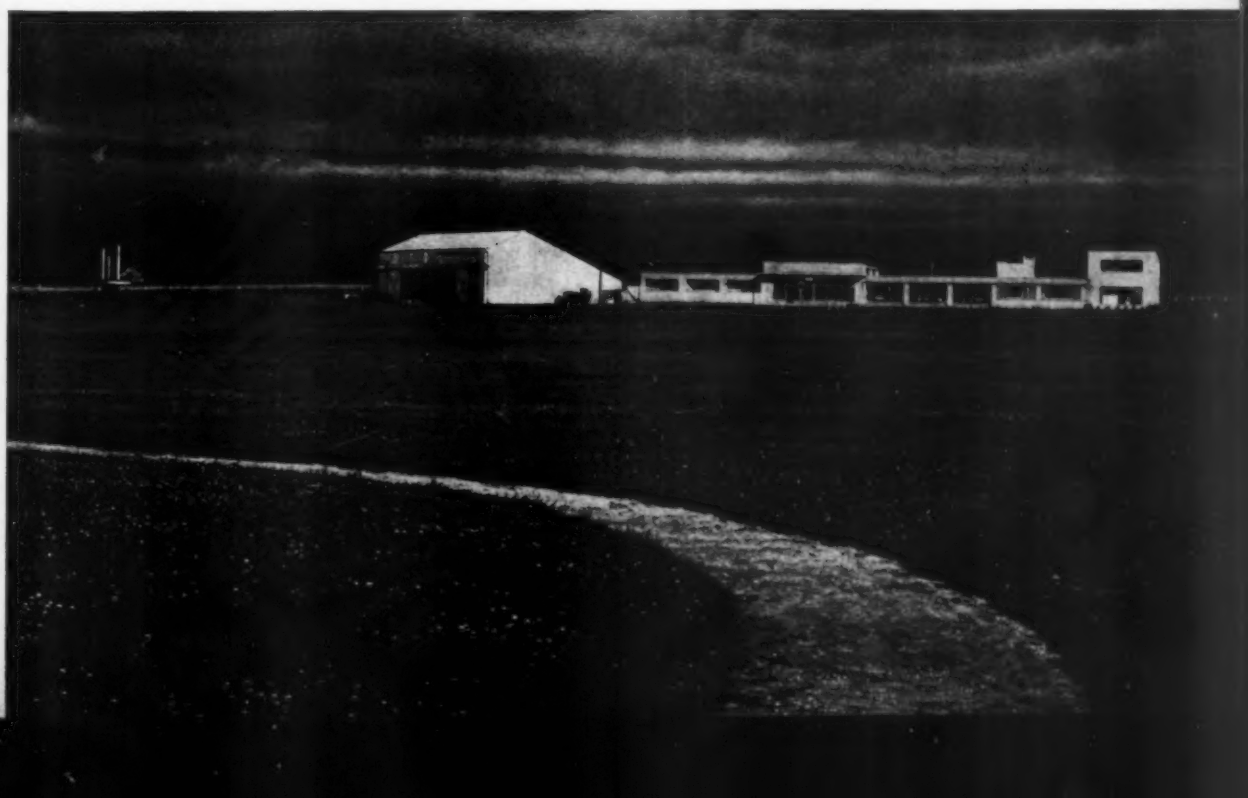
THE airport terminal buildings which we have designed in collaboration with Mr. Whitney Straight's organisation are almost without precedent in this country. In very few cases previously have expert advice and opinion been available to a municipality before any buildings existed, and in this case the advice is the result of actual experience of the problems involved and the demands which have to be met.

The questions involved in the design of terminal buildings for maximum efficiency have been somewhat neglected in the past, and it was not a moment too soon that Mr. Whitney Straight's organisation began a serious study of the whole problem a few years ago.

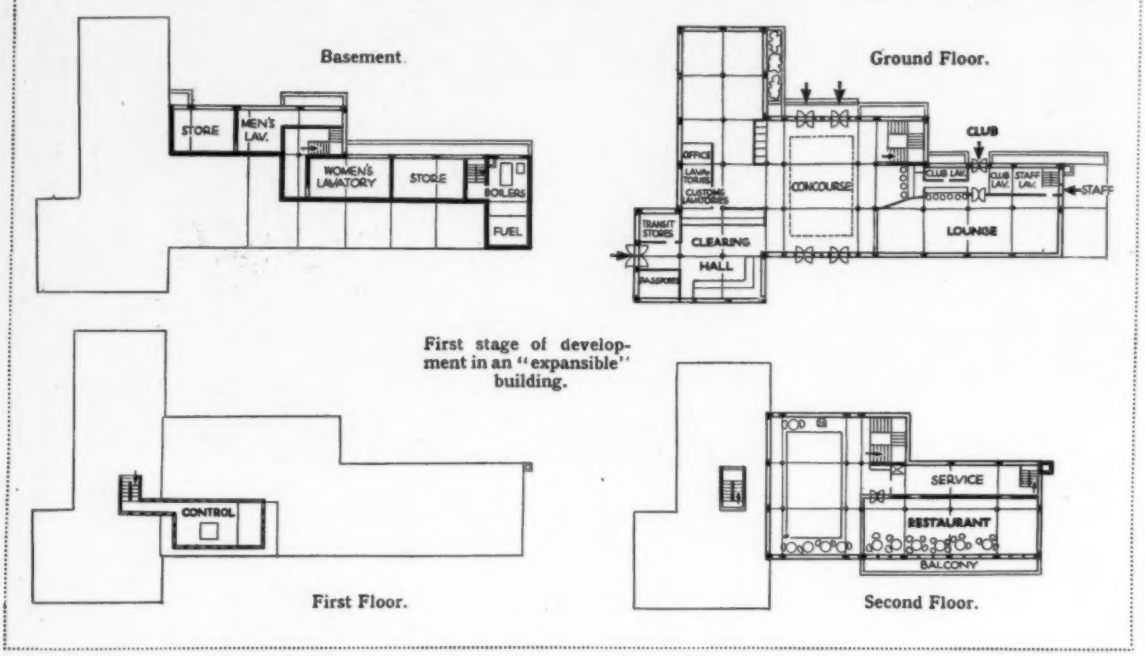
As a starting point of the train of thought there was that perennial question, "Can an airport be made to show a reasonable financial return while making its due contribution to the life of the town which it serves?" The answer is still being formulated—and an affirmative reply is by no means assured. At least, however, it has been possible to pursue logically—always in the light of experience and frequently as a result of experiment—every argument affecting buildings which arises out of this question.

The result has been that we, as architects, were presented at the outset with a programme which was probably more clearly defined, but at the same time a great deal more complicated, than has previously been possible for comparable buildings. The success of any building project should be in direct proportion to the degree of clarity with which the functions of the building are previously defined; at Exeter and Ipswich we were fortunate in the lucidity of this definition.

It is impossible to give a list of the requirements which were laid down, but the two to which most importance was attached were those qualities which, in our opinion, had hitherto been most neglected both here and on the Continent. They may be briefly set out as follows:



Another example: Exeter Airport buildings, as seen from the landing area.



1. Air travel is a novelty to many people. The building must, therefore, remove any confusion or doubt in the minds of the travelling public—which forms the greatest potential asset of civil aviation.

2. A well-found airport will inevitably need enlargement. Whether its growth will be as a club, a traffic junction, a Customs or freight depot, a social or technical centre, or a link in the chain of National Defence, it is impossible to say in advance. The building must be capable of expansion to meet any or all of these needs.

It was the second of these two requirements which made the problem intricate, and it was some time before we evolved a plan capable of fulfilling all these needs.

Briefly, the plan finally adopted centres round a main concourse, giving unobstructed views of, and access to, the field, and also providing access on one side to the business and management activities, and on the other to the rooms devoted to flying club, catering and recreation.

These two clearly defined sections of the building were then designed in a series of bays, based on a standardised unit of steel framework, which, though complete for the time being, can be added to on three sides or on top as the need arises. The constructional details were worked out so that future storeys, or extensions on ground level, could be added without interfering with any of the existing rooms (even the new floors can be laid direct on the covering of the flat roof) and the steel frame designed to take the weight of any reasonable additions over.

Heating pipes, electric mains and other services were arranged so that connections to future extensions can be made without disturbance, but no attempt was made to provide lavatories, kitchen or other service rooms large enough to cater for future extensions, since this would obviously be uneconomical over a considerable period. If the needs of the future are such that alterations of the present plan become necessary, all or any of the internal partitions can be taken down or re-erected, the whole of the weight of the roof being supported either on steel columns or on the external walls.

The salient points of the building as carried out are: Comfort for club members; clearly defined routes for the travelling public; smooth circulations of traffic in offices and Customs. The club lounge and dining-room are divided with folding doors, which can be opened to give a dance floor seventy-five feet long and having a bar at one end and a snack counter at the other, while the whole of the front of these rooms opens with more folding doors on to a broad terrace, protected with sun-blinds, and surrounded with what is rapidly becoming a very pleasant lawn and garden.

It was our intention at the outset to standardise the buildings at the different airports of the Straight group with which we have been concerned, and although this has been done

At Ipswich Airport: The restaurant, with club lounge beyond.

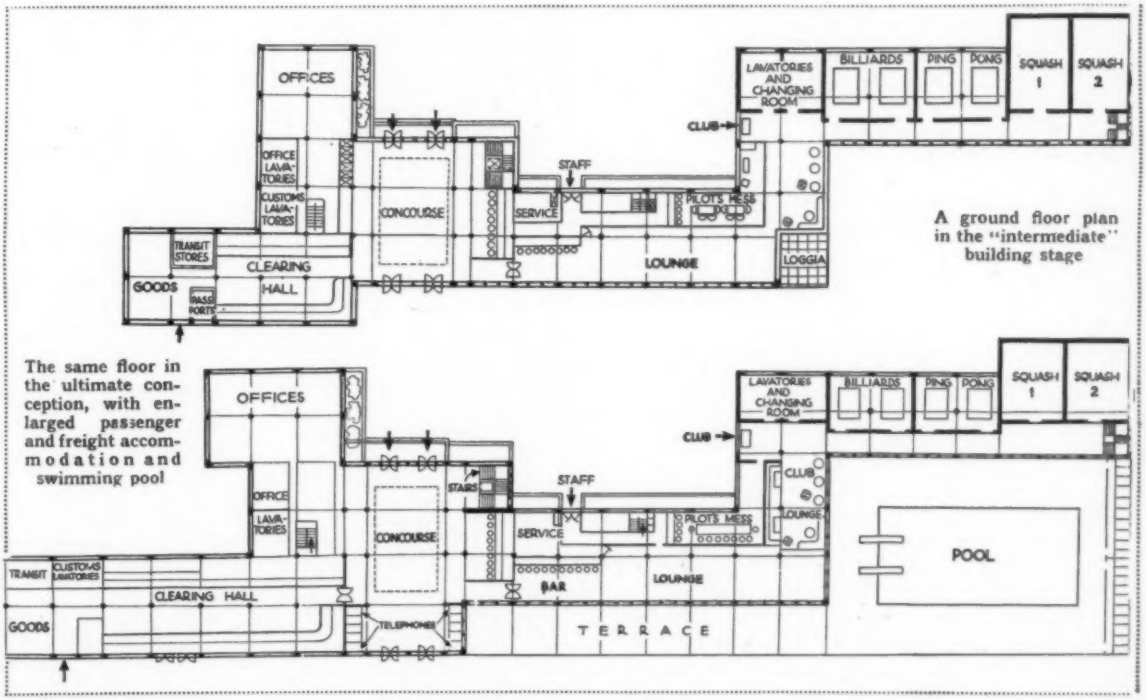
The concourse at Ipswich, looking towards the landing area.

so far as the plan goes, the actual execution varied a good deal in each case and gave to each building a definite character of its own. The cost of transport made it advisable to use local materials on the different sites, and variations of aspect had a bearing on the position and sizes of windows. The actual accommodation, too, varied, and in one case a fair-sized Customs department was needed to cope with Continental traffic, while in another case the strength of the club and the energetic nature of its members made an additional squash court desirable.

At neither of these airports was it thought necessary at the outset to provide anything in the nature of a control room, but plans have been completed for the addition, at Exeter, of a large extension of the building to provide joint accommodation for the Air Ministry's Meteorological, Signals, and Control station which it is proposed to establish here.

This extension has been fitted in beside and above the existing offices exactly as we anticipated, and is itself designed to be built in two stages, Control and Radio being the two most urgent requirements at the present juncture.

This development, which was first discussed before the present building was completed, seems to us to be a complete justification of the policy of providing for expansion which has, throughout the building programme, been uppermost in Mr. Straight's mind.



A ground floor plan in the "intermediate" building stage

The same floor in the ultimate conception, with enlarged passenger and freight accommodation and swimming pool

CANADIAN PRODUCTION

CANADA is now practically ready to begin production of aircraft for the British Air Ministry.

Mr. Paul F. Sise, president of Associated Aircraft, Ltd., the central assembly organisation, stated in Toronto a few weeks ago that the company and the six aircraft-building concerns of which it is composed are starting to train 2,400 men immediately. The central assembly plants, one at Malton Airport, Toronto, and the other at St. Hubert Airport, Montreal, will be started on late in the spring. The three Ontario companies, National Steel Car, Fleet Aircraft and Ottawa Car, will send components of Handley Page Hampden bombers to the Malton plant, while the three Quebec companies, Canadian Car and Foundry, Fairchild and Canadian Vickers, will feed the St. Hubert plant. Mr. Lewis C. Ord will return to Canada in February to become general manager of Associated Aircraft, Ltd. Fifty Canadian craftsmen have been sent to England to study methods of production at the Handley Page plant.

Canadian Car and Foundry has bought a plant at Lachine, near Montreal, where it will build bomber parts. Fleet Aircraft is expanding its plant at Fort Erie, Ontario. De Havilland Aircraft of Canada, at its Toronto factory, recently completed delivery of 25 Tiger Moths, made entirely in Canada, to the Canadian Government, and has received an order for 200 Tiger Moth airframes for delivery to the parent company. It has expanded its plant also during the year.

Flt. Lt. H. Bailey, chief test pilot to the Blackburn Company.

Illustrated with "Flight" photographs.

FIGHTER BOMBERS for the F

Blackburn Skuas on Test Before Delivery to the Fleet Air Arm : Some Flying Experiences at Brough

BEFORE long a number of squadrons of the Fleet Air Arm will have been equipped with the Blackburn Skua two-seater fleet-fighter dive-bomber fitted with the Bristol Perseus nine-cylinder sleeve-valve engine. A useful quantity of these formidable deck-landing monoplanes has already been taken over after having been passed out by the Blackburn test pilots, with whom we lately had the pleasure of spending a day at Brough.

Here, on the north bank of the Humber, may usually be seen a covey, muster, gaggle or skein of silver Skuas in flying trim or, with folded wings, trailing astern of Donald the Debogger, an industrious little tractor whose sobriquet is explained by his silhouette, his web-footed characteristics, and the way he has with recalcitrant Skuas in soft corners of the aerodrome.

Three pilots are engaged in trying out the Skuas. Senior among these is Flt. Lt. H. Bailey, who formed his attachment for this flying business as a boy wireless operator on board Zero-type airships on anti-submarine patrol in the Channel. After a post-War spell as an engineer he took a short-service commission in the R.A.F., in which he became a flying instructor. Leaving the Service in 1932, he joined North Sea Aerial and General Transport, Ltd., with whom he served as an instructor at the Brough Flying School. On many occasions he did test-flying for the Blackburn Company before becoming chief test pilot. His colleagues are Flt. Lt. H. J. Wilson and F/O. B. R. Rolfe. Flt. Lt. "Willie" Wilson joined the R.A.F. with a short-service commission in 1929 and, by way of Sealand, went to No. 111 (F) Squadron at Hornchurch, where he flew Siskins and Bulldogs. He gained "aero-nautical" experience on Fairey III F floatplanes at the School of Naval Co-operation. From 1934-35 he was instructor at the York County Aviation Club; from 1935-37 he instructed at Brough and Hanworth; and from 1937-38 was a civil test pilot at Farnborough. He has flown about 100 types and has 2,500 hours in his log book. He joined the regular testing staff at Blackburns on June 1 last year. Rolfe joined the R.F.C. in 1917 and went overseas to fly S.E.5s and Camels. In 1929 he re-entered the R.A.F. with a short-service commission, and before going to Brough last year had eight years of test flying at the Greek National Aircraft Factory, established by the Blackburn Company, at Phaleron, near Athens. So much for the men.

As for the machines, current secrecy regulations set a definite limit on what may be said. Basically the Skua is a low-wing cantilever monoplane with an outwardly retracting undercarriage. The wing fillets are integral with the fuselage and extend almost to the tail unit; the extreme wing tips have a sharp dihedral angle. Like the Shark biplane, the Skua has a watertight monocoque fuselage which renders unnecessary the provision of flotation gear.

Points worthy of special mention are the tail unit, with the fin and rudder placed forward of the elevators and tailplane, and the fine forward view over the engine cowling for dive bombing. As a matter of interest, the span of the Skua is about 46ft., or approximately that of the Shark biplane. The length (35ft. 7in.) is a shade more than that of the Shark.

The Skua is the first monoplane to be adopted by this country as standard equipment for carrier operation, and represents a new class of Fleet Air Arm machine—a two-seater equipped for combating enemy aircraft during naval operations; for making low attacks on the upper works of ships; and for delivering dive bombing attacks against the decks of warships.

Flt. Lt. Bailey was good enough to back up his enthusiastic claims for the Skua by a demonstration in the air, with the writer in the gunner's position. This was, incidentally, our first flight behind one of the sleeve-valve Bristols. The smooth uncompromising urge imparted for take-off and the steep initial climb augured well for the popularity of the new Blackburn when it reaches the carriers.

Looking back through the Perspex enclosure we watched Brough diminishing in the late afternoon haze

(Right) Half a dozen Skuas (some on test, others having borne Service pilots to Brough to collect further machines) and, in the foreground, one of the Mercury-engined prototypes on a sunny morning at Brough.

From left to right are Flt. Lt. H. J. ("Willie") Wilson; Wing Cdr. R. J. M. de St. Leger, "overseer," or liaison officer between the Service and the Blackburn Co.; Flt. Lt. H. Bailey, chief test pilot; and F/O. B. R. Rolfe.

A production-type Skua fleet-fighter dive-bomber in a characteristic attitude. The photograph was taken from another Skua diving in formation.

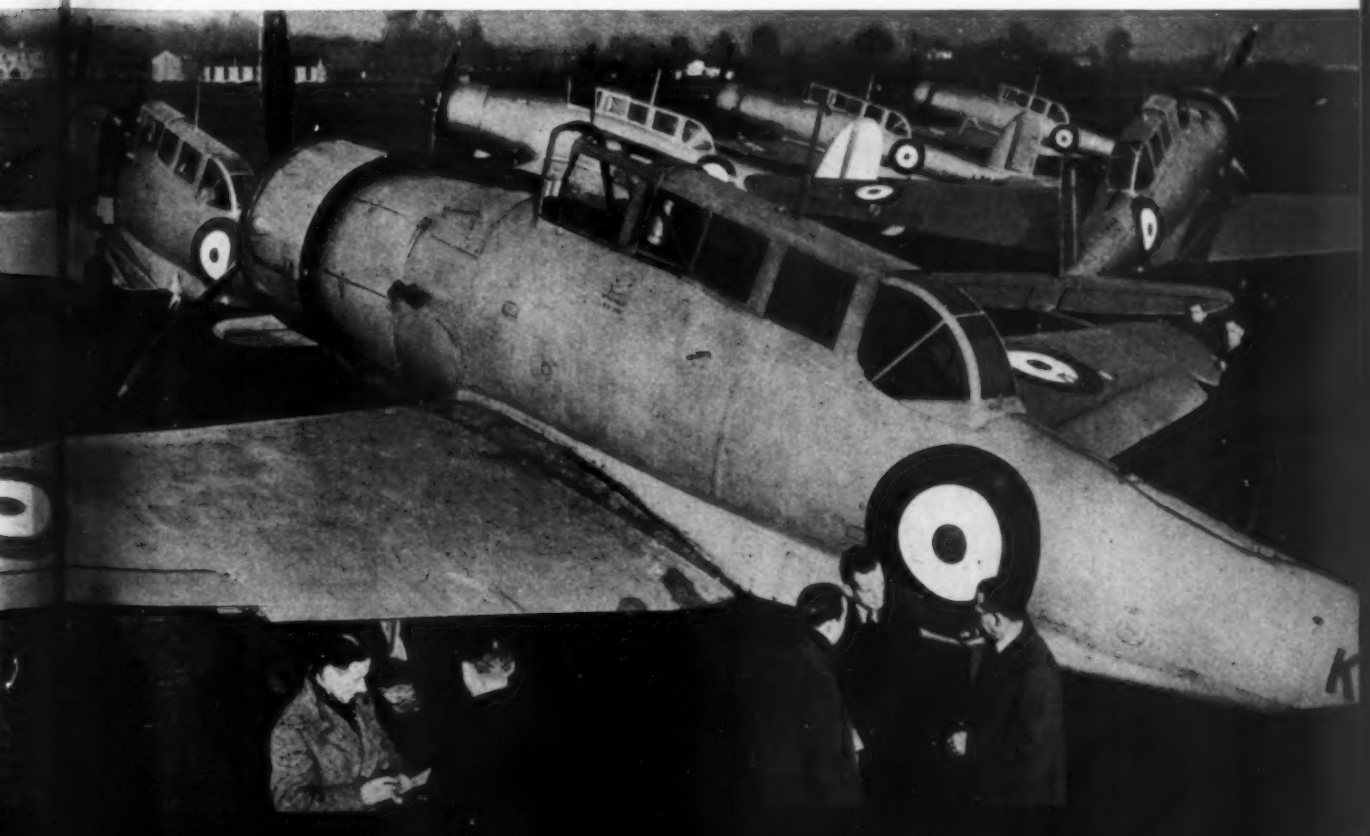
until, at 8-9,000ft. we flattened out, and Bailey, with the needle well on the way round the A.S.I., collected a few G in vertically banked turns, changing straight from one hand to the other. Aerobatics were ruled out as we had no harness or "dog chain," though there was a useful transverse bar across the fuselage. This was appreciated, particularly when Bailey throttled back and tipped the Skua straight over on to her nose, leaving us, to all intents and purposes, swimming in air and defying all the laws of gravity and rational behaviour. We did three dives at between 80 and 90 deg.

the FLEET

By the third, one was deriving genuine pleasure from floating about in the Alclad confines like an acrobatic goldfish in a jar, watching the horizon tilting at right angles, dropping steadily towards the Yorkshire fields or grey Humber, and waiting for the pull-out. On the final dive, Bailey used his ailerons to give a corkscrew effect. The Skua never seemed happier than when diving.

After our third dive we hurried down, for Mr. Ely, who handles a ciné camera as efficiently as he runs the company's publicity department, was waiting to take a film of the relative movement of the main undercarriage and tail wheel. For this purpose he gets Flt. Lt. Bailey to taxi about on a rough part of the aerodrome. Incidentally, Mr. Ely, like Flt. Lt. Bailey and F/O. Rolfe, holds a wireless operator's licence, and does a good deal of business flying in the company's radio-equipped Stinson.

H. F. K.



Modern Trend Towards Indicating Safe Landing Runs : How the "Contact Light" System Operates

By A. T. VULLIAMY, M.A., A.M.I.E.E.

NEW CONCEPTIONS of AERODROME LIGHTING

THE past three years, so full of change in most things, have not greatly altered the problems that confront those entrusted with the design of aerodromes and lighting equipment. In this country, it is thanks to the co-operation of the Air Ministry and the far-sighted policy of certain municipal aerodrome owners that progress is now being made, both in the design of equipment and in the knowledge of what the future will require.

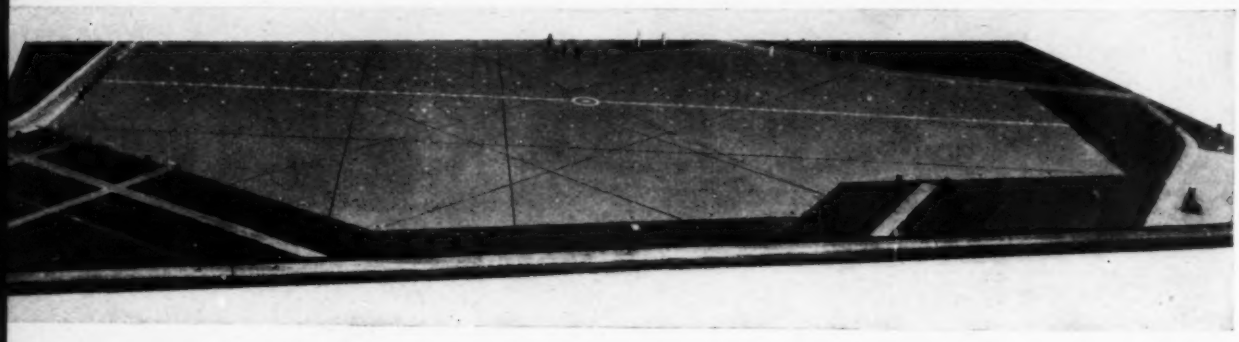
Except on long distances and overseas, and, to quote Mr. D. O. Lumley, O.B.E., Assistant Secretary of the Post Office, in a recent lecture: "Until night flying becomes a normal procedure, air services for mail-carrying purposes cannot be expected to compete with existing surface transport." A considerable amount of work on the ground remains to be done to make inland air routes safe for night operation in all seasons.

The illumination of a large area of the landing ground by one or more floodlights fixed at the boundary continues to give, in fair weather, an easy approach and landing for the medium-sized transport aircraft of to-day. Improvements now being tested, including the use of high-pressure mercury-vapour discharge lamps, should increase both the output of light and the uniformity of illumination produced by a given unit. The characteristic colour of the mercury lamp is said to be particularly effective in lighting a grass-covered surface.

Aircraft landing lights are also being improved, and two

(Above) Manchester's contact-light system shown diagrammatically, indicating the colours seen by a pilot coming in from the left. The last quarter of the line itself is red. Colours are seen in the same—not the opposite—sequence if an approach is made from the opposite direction.

(Below) This illuminated model of an airport was of considerable assistance in arriving at the final layout of the contact-light system at Ringway.



lights of up to 1,000 watts each are now being carried. Although the efficiency of the light units is not so high and their value during the approach to the boundary is naturally restricted in comparison with the aerodrome floodlight, with lengths of run increasing to 800 yards, a point is reached where the aircraft lights have to "take over" from the floodlights, owing to the shorter distance and higher angle from the ground, and experienced pilots place great reliance in their aircraft lights for completing a landing.

Light fog or mist alter conditions entirely, and this has led to the development of runway marker lights set flush in the surface of the landing ground, a development which was strongly advocated by the writer in an article published by *Flight* two years ago. The lights are laid out along the centre line or along each side of the runway. One line makes an improved flare-path, two lines indicate positively the plane of the landing ground; three lines may look dazzling to some, but others will prefer to have them all "on." Those who have seen the runway marker lights in use at Newfoundland, Manchester, and elsewhere agree that they provide a very valuable aid in all weathers.

A well-known problem here arises: what directions of landing are to be catered for? At present, lighting along four runways giving eight directions of landing is wisely advocated, and conforms with the recommendations for the Standard Airport, but it is not everyone who is prepared to accept even this limitation of the "all-way" principle. Calculations show that the shock of landing at 30 deg. out of wind should not be very much greater than at 22½ deg., and this would allow a reduction in the number of runways to three. Tricycle or four-wheeler undercarriages and other developments may bring further freedom for cross-wind landings, but it is generally agreed that for heavily loaded, high-speed aircraft at least two runways approximately at right angles will be needed for a long time to come.

One of the three G.E.C. 6 kW floodlights recently installed at Ringway.

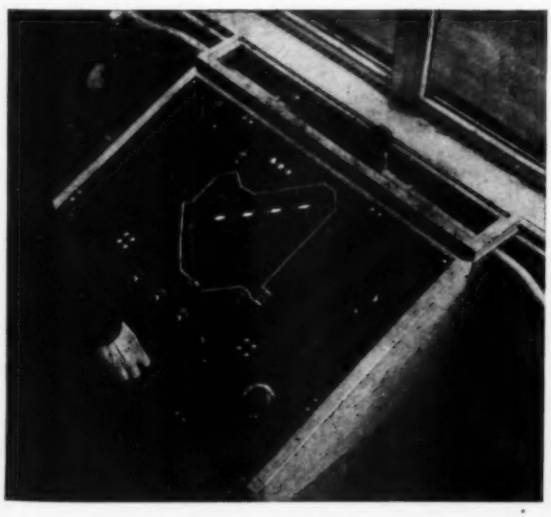
Runway marker lights are of particular value for so-called fog landing runways, and here a spacing of 50ft. between lights in the centre of the runway and along the equi-signal axis of the radio beacon transmitter is being standardised. In the case of new aerodromes which may be of sufficient importance to be developed as "super terminals," it has been thought wise to provide for construction in the future of two runways at right angles, each four hundred yards wide, with appropriate lighting in conjunction with radio guidance from four directions, thus allowing for landing in low cloud and nocturnal rainstorms, as well as in the usual still-air fog conditions.

Apart from the one fog landing runway required at present, three single lines of lights at 50 yards spacing are considered adequate both as an aid to landing in accordance with article 16 (2) d. (ii) of the Air Navigation (Amendment) Order, 1937, Schedule IV, Section 2, and as a guide to the unobstructed lines of approach or flightways which are required to comply with Air Ministry Pamphlet No. 76.

For the latter purpose runway marker lighting is more effective than the system of "range" lights used in America, where corresponding groups of green lights at each end of a runway have to be "lined up" to give the direction of landing. The American system is economical in capital cost because the range lights are fed from the same cable as the boundary lights, and they are all switched "on" together. It might be thought that mistakes could be made when a rainstorm or an aircraft landing ahead obscured a light at the far end of the runway, but there is no record of an accident due to this cause.

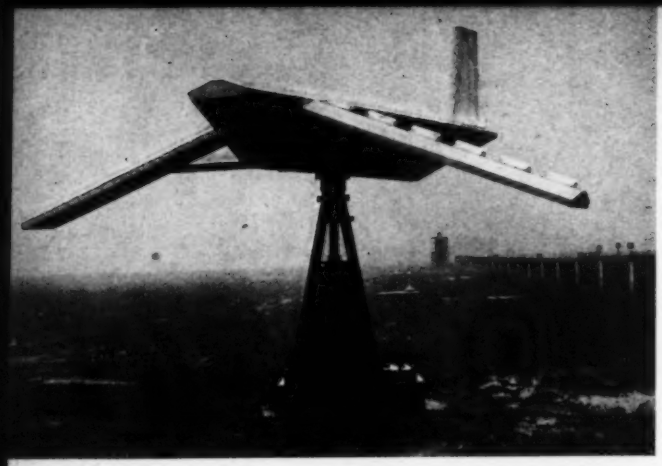
First Experiments

The first installation of runway marker lighting to be completed in this country is at the Manchester Corporation's new airport at Ringway, and a demonstration was described in last week's issue of *Flight*. The complete installation (including, besides the marker lights, orthodox boundary and obstruction lights and three fixed floodlights) was designed nearly two years ago, by the consulting engineers, Messrs. Norman and Dawbarn, in collaboration with the Corporation Electricity Department, taking into consideration the extensive additions to the landing ground and building area which can be made in the future. At the same time an illuminated model of the runway marker lighting and approach lights was constructed, and this has proved very useful in the subsequent discussions



(Above) The control-tower panel for switching of the contact-light strip. Note the representation of the strip, in which tell-tale lights repeat what is happening outside.

(Right) One of the Chance flush-fitting lights in the contact strip. They are stressed to take heavy loads.



Rather suggestive of a dejected albatross—the Chance illuminated wind indicator at Ringway.

with representatives of the Air Ministry, the Royal Aircraft Establishment and the operating companies.

The landing ground is roughly triangular in shape with unobstructed approaches to each corner, and consequently three floodlights provide illumination for all-way landings. Six-kilowatt units of the latest type manufactured by the General Electric Co., Ltd., have been installed, and one is illustrated in this article. The whole of the installation contract was carried out by Clough Smith and Co., Ltd., of Westminster.

It was decided that marker lighting along the fog landing runway only should be installed in the first place. The lights are set in the fog line along the equi-signal axis of the main radio beacon transmitter which is to be installed at the south-west end of the runway.

The United States Department of Commerce has recommended the use of two lines of lights, one along the axis of the beacon and one offset 20ft. The spacing between lights along each line is 100ft. In the lighting scheme for Ringway first submitted for Air Ministry approval, three lines of lights were included, since landings may be made from either side of the line, according to wind conditions. The side lines were set with lights at a wider spacing in order to give an indication of the surface of the ground rather than as a substitute for the continuous fog line. It was eventually decided to omit the side lines, as they can easily be added later if experience shows that they would contribute to safety.

Flush Lighting

The fog line itself consists of a continuous reinforced concrete strip 24in. wide extending to a length of 1,380yds. At 50-ft. intervals "boxes" were formed in the concrete with precast concrete covers in which the marker light fittings rest. At each light, also, the line is opened out to form a slab 6ft. long and 3ft. 6in. wide. The surface of the concrete is slightly cambered up from ground level at the edges so that the top of the fitting is 2½in. above it. This makes it a simple matter to cut the grass round the lights without fear of damage, and the lights can be seen when taxying from any point on the landing ground. The whole of the work is designed to carry wheel loads of 20 tons with pressures up to 100 lb/sq. in., which is considerably greater than the loads carried by turf at the present day.

The lights are connected alternately to two separate cables, so that a cable fault would not extinguish more than half. Paper-insulated, lead-covered cables with plumbed joints are used throughout, drawn into two separate ducts formed in the concrete line. This achieves the object of allowing for the replacement of any fittings or length of cable without disturbing the ground. Also, the concrete covers in which the fittings rest are sufficiently large to allow for the use of more powerful fittings of a different form at the end of the fog landing runway, which may be found to be desirable when the aerodrome is extended. The whole of the fittings can, in fact, be rearranged when lighting is installed along three other runways. Concrete slabs will again be used for fixing the fittings, but it is not intended to run a continuous concrete strip between them along the other runways.

The control panel fixed in the control room facing the landing ground is shown in another view. From this the whole of the aerodrome lighting is operated, while switch and signal-lamp circuits are incorporated to allow for future developments. It was manufactured by the Automatic Telephone and Electric Co., Ltd. Switches for controlling the stand-by generating plant, the cloud-height searchlight, the crash alarm and a G.A.L. smoke wind indicator are also included. The arrangement of the signal lights for indicating that the fog line is illuminated can be seen in the illustration. The tell-tale lights are of particular importance, as in fog it is impossible to see from the control room that the lights are working. It may be remarked here that the value, particularly in time of war, of a flare path which can be switched on and off in a fraction of a second from the control room is not being ignored.

The most important quality of the lights themselves is naturally to give the required intensity of light in all directions from which they are normally to be seen. Early attempts to use runway-marker lighting were unsuccessful, as the fittings used directed a powerful beam of light straight up into the sky, and the range of visibility below an angle of about 40 deg. above the horizontal was extremely limited.

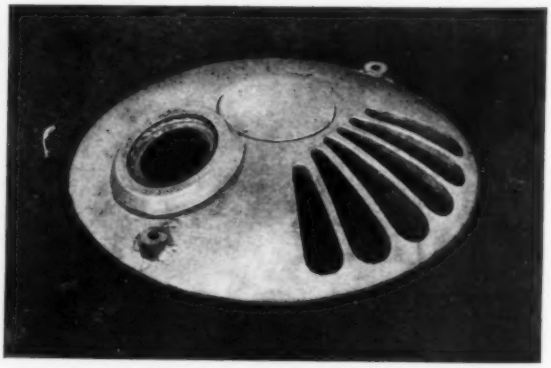
The Scheme in Practice

For example, in a thick night fog which would absorb or scatter nearly 99 per cent. of the light from the fitting in a distance of 100ft., an intensity of 100 candles would be required at an angle of 9½ deg. to be visible at a height of 50ft. and a distance of 100yds. (six lights ahead along the fog line). A still higher intensity is required at dusk, when the lights have to compete with a background of appreciable brightness. Specifications have since been issued calling for sharp peaks in the light-distribution curves at particular angles, but since some compromise is necessary to cover the wide range of conditions occurring in everyday use, a high but not necessarily uniform intensity between 5 deg. and 20 deg. above the horizontal in all directions of azimuth was called for at Manchester.

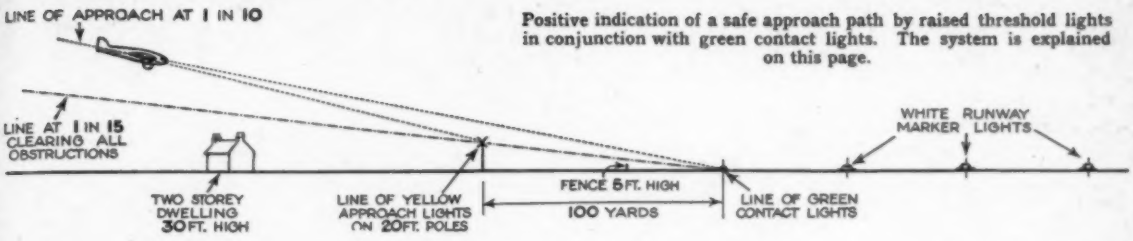
Above 20 deg. the intensity falls progressively to about one-quarter of the maximum at the vertical. Roughly speaking, the object of this was to obtain a mushroom rather than a vertical shaft of light, so that in mist it is possible to see over the nearest light to those beyond.

The use of different light sources, including the sodium-vapour lamp, was considered, but after discussion with the various people concerned it was decided that the best method of obtaining the correct light distribution as well as the matching of intensities for the various colours required was with a filament lamp giving a "point" source combined with a glass cover in the form of a concave lens.

Apart from this, the main object in designing the fittings



One of the sixteen "mushroom" housings which give direction to lights placed round the aerodrome circle, in the centre of which is the G.A.L. smoke-type wind indicator. White light is projected horizontally on to the smoke through the slots. The dark opening on the left is covered with heavy-gauge glass, through which coloured light flashes the aerodrome's code signal around and upwards.


LINE OF APPROACH AT 1 IN 10
LINE AT 1 IN 15 CLEARING ALL OBSTRUCTIONS
TWO STOREY DWELLING 30FT. HIGH
LINE OF YELLOW APPROACH LIGHTS ON 20FT. POLES
FENCE 5FT. HIGH
100 YARDS
LINE OF GREEN CONTACT LIGHTS
WHITE RUNWAY MARKER LIGHTS

Positive indication of a safe approach path by raised threshold lights in conjunction with green contact lights. The system is explained on this page.

was to obtain the required output and distribution of light, with reasonable economy in the electric power consumed, from a single fitting which was to be mechanically strong, compact, simple and entirely weatherproof. The fittings installed at Manchester were supplied by Chance Brothers and Co., Ltd., who have achieved this object with considerable success. The cover glass, only ¾in. thick at the centre, projects 1in. above the surface and is set with special cement on a seating machined in a circular cast-iron cover plate.

In the test room these glasses have successfully withstood a hydraulic pressure test of 600 lb./sq. in., corresponding to a load of 38 tons/sq. ft. A single casting houses the lamp, reflector, isolating transformer and cable box. A circular flange forms the top of the housing, on which the cover is bolted with a gasket joint. From it the load on the cover is transmitted directly to undisturbed ground through the concrete slab. The maximum intensity of light is obtained at an angle of 8 deg. above the horizontal, and amounts to 130 candles with a 600-lumen lamp. Colours are obtained by means of filters fixed under the cover glass, and in this case a 1,000-lumen lamp is used. Osram low-voltage lamps with a guaranteed average life of 1,000 hours, similar to those used for the boundary lights, are being used.

Additional Guidance

As a further aid to landing and take-off in fog at Ringway, cross-bars at right angles to the fog line, and set with marker lights at 30ft. spacing, are provided. They are partly to help to locate the surface of the ground and partly to indicate distances along the runway. Approaching from either end, a green bar 40yds. inside the fence is switched on independently, according to the direction of landing. A single white bar marks the end of the first quarter, and a double white bar the centre. At the beginning of the last quarter a single red bar is placed 40yds. from the farther fence, and thereafter the lights along the centre of the runway also show red.

The green lights at the near end of the runway may well and truly be termed "contact" lights, as they mark the line on the ground nearest to the boundary at which a normal approach may be aimed. In conjunction with runway marker lights they take the place of the "range" lights used in the United States. They may also be considered as a first step in providing one system of the approach guidance which is likely to prove the most important development of the immediate future.

It has been thought for some time that the purely negative indication provided by obstruction lights does not allow full use to be made of the increased lengths of run which are now being provided at major airports along certain flightways only. The civil aerodrome is necessarily situated as near as possible to the city it serves, usually in a district which is rapidly becoming built up. Where surrounding land rises above the level of the landing ground, the number of obstruction lights required may run into scores.

At the new Birmingham aerodrome, for example, in spite of excellent approaches, 96 obstruction lights would be required to comply with the British Standard Specification for aerodrome lighting, and of these 70 are on the south-west side of the landing ground. Every motorist knows how hard it can be in rain or mist to judge the distance of a single red rear light straight ahead on a level road. In spite of careful placing and uniform intensity, to judge accurately the positions in space of a mass of lights is almost impossible, and all that a pilot can safely do, even with a good knowledge of the terrain, is to give them a wide berth.

Hence a number of schemes have been suggested for supplementing, or even replacing, the negative indications of obstruction lights by a positive indication of the safe path to follow, utilising special approach lighting. What appears to be the most promising system, although it still awaits the test of practical experience, relies on the runway marker lights to give directional guidance along the centre of the runway or "flightway." Vertical guidance is provided by using special approach or "threshold" lights raised on poles outside the boundary indicating, in conjunction with the green "contact" lights, a sloping plane above which there are no obstructions, in the same manner as leading lights are used to define the limits of the safe approaches to a seaport. It is intended to use 50-watt sodium-vapour lamps in special fittings for this purpose. It will be seen from the accompanying drawing that by keeping the green contact lights in view above the yellow threshold lights an approach clear of the highest obstructions is ensured.

Approach Assistance

Another system which has been proposed consists of a number of lights fixed on the centre line of the flightway, each successive light being raised to form a line sloping up from the boundary at the requisite angle above which there are no obstructions. A number of different types of leading lights in prolongation of the centre lines of runways have already been used abroad. At Le Bourget the fog line is "produced" for a distance of four kilometres by 50-watt sodium lights at fifty metres spacing.

How far these leading lights are useful in bad visibility for supplementing the guidance given by V.H.F. radio beacons still remains to be seen, but there would appear to be a good case for having them between the inner marker beacon and the boundary at a similar spacing to the lights along the runway.

It is obviously essential for these lights to be of characteristic form and colour, and this is where the lack of a new colour may become a problem. The yellow colour of the sodium light is already associated with the boundary, and some people consider that it should be used exclusively for boundary marking. The high-pressure mercury-discharge lamp also gives a high output of light at a reasonable power consumption, but unfortunately in fog the colour may easily be confused with green. Red neon tubes in the form of an arrow pointing in the direction of flight have also been suggested, but it is difficult to obtain sufficient range of visibility in fog.

The Future

Further experience in radio-guided approach is necessary before the best method can be decided on. When it is, it will no doubt be found useful on every flightway where radio guidance is used to relieve congestion in low cloud or storm conditions at a busy airport. It is even more important to provide a clear and positive indication of the direction and angle of all the unobstructed approaches, in addition to the aerodrome lighting at present standardised.

The use of approach lighting for landing and take-off at night may call for further regimentation in the form of compulsory climb or power glide without deviation from the line of the flightway between aerodrome level and a safe height. The use of approach lanes, with or without radio, will also set some difficult problems in air traffic control, but there is reason to believe that those in authority will not be slow in providing the solutions.

SERVICE AVIATION

FOUR-GUN TURRET: Sir Kingsley Wood enthroned in a power-driven gun turret at the works of Parnall Aircraft. The fourth barrel may just be discerned behind another.

Royal Air Force and Official Announcements : Fleet Air Arm News : Military Aviation Abroad

The Air Minister's Office

THE Air Ministry announces that ever since the Royal Air Force was formed it has laboured under the disadvantage that the headquarters of the Air Ministry have been located in Kingsway, at a considerable distance from all the other Government Departments mainly concerned with matters of defence.

The developments of the last few years have shown that it is desirable that the Secretary of State and certain important departments of the staff of the Air Ministry should be accommodated in Whitehall, where they will be conveniently situated in relation to the Offices of the Cabinet and Committee of Imperial Defence and the other Departments with which the Air Ministry has day-to-day associations. As there is no vacant accommodation in Whitehall, room is being found for them by transferring the staff of the Board of Education from Whitehall to certain of the offices hitherto occupied by the Air Ministry in Kingsway.

News of the Lockheeds

ACCORDING to a Press release from the Lockheed Aircraft Corporation, the first of the 200 Lockheed reconnaissance bombers for the Royal Air Force exceeded all expectations during performance tests conducted under the supervision of Sqn. Ldr. J. R. Addams. The first machine of the series should be flying in this country very shortly.

This machine made the 2,430-mile trip from Burbank, California, to New York in twelve hours. It is believed that by the early summer the Lockheed Company will be turning out machines of this type at the rate of 25 a month. They will be shipped direct from Los Angeles via the Panama Canal and will be tested in England by Mr. Percy Hutton, of the Lockheed Company.

A.A.F. Gains and Losses

IT is sad, and fortunately unknown since the days of demobilisation, to see a squadron disappear from the strength of the country, but that has been the fate of No. 503 (County of Lincoln) (Bomber) Squadron. It has been disbanded during the last month. The squadron was originally formed at Waddington as a Cadre Squadron, with about half of its personnel regulars and the other half belonging to the Special Reserve. It was equipped with twin-engined heavy bombers and was intended to be a night-flying unit. Some years ago, representatives of *Flight* visited the squadron, and found that its ancient Handley Page machines were all unserviceable, while Lincolnshire had been so hard hit by the agricultural depression that the Special Reserve officers and airmen could not afford the expense of putting in much training with the squadron. Since then No. 503 was converted into an Auxiliary Air Force unit, which deprived it of most of its regulars and called for more citizen personnel. It seems that this was asking for more than the impoverished county could manage, and in the December issue of the *Air Force List* the squadron showed a strength of only five Auxiliary Flying Officers, one Pilot Officer, an Equipment Officer and a Medical Officer. In the January list No. 503 has disappeared.

In its place, No. 616 (South Yorkshire) (Fighter) Squadron has been raised at Doncaster, and definite proposals have been made for raising another A.A.F. squadron at Ringwood, Manchester. At the same time the County of Warwick Squadron has been converted from a bomber to a fighter unit, with the result that now there are no bombers left in the A.A.F., but there are fourteen fighter squadrons pledged to the defence of their own hearths and homes.

Short-Service Officers

CANDIDATES for short-service commissions in the Royal Air Force are in future to have the opportunity of a longer period of service on the active list. The upper age limit for applicants from civil life will also be raised from 25 years to 28 years. The lower age limit remains at 17½ years.

In future candidates when accepted will be invited to indicate whether they desire to serve four years on the active service list and six years in the Reserve, as at present, or six years on the active list and four years in the Reserve. Candidates accepting the latter alternative will have the opportunity of promotion to the rank of Flight Lieutenant and the prospect of qualifying for a gratuity of £500 at the end of their six years' service on the active list, instead of the £300 gratuity paid after four years' service. Short-service officers already serving will also have the opportunity of extended active list service.

Candidates for short-service commissions may obtain full particulars from the Under-Secretary of State, Air Ministry (Dept. S.7.e.), Kingsway, London, W.C.2.

Ex-Warrant Officers

IT has been decided to consider applications from suitably qualified ex-Royal Air Force warrant officers for appointment as engineer officers under the Royal Air Force Substitution Scheme. The rate of pay will be £370, rising by increments of £10 a year for approved service to £420 a year; this will be in addition to any service pension that may be in issue. The appointments will be temporary and non-pensionable, subject to a probationary period of one year and thereafter to one month's notice on either side. Selection will be confined to ex-Royal Air Force warrant officers, of not more than 55 years of age, who are no longer serving on regular engagements and who were recommended for a commission during their service or are now employed in a civilian capacity at a R.A.F. unit or establishment and are regarded as suitable in all respects to hold officer rank.

Our Turrets

PURSUING his policy of paying personal visits to the works which are playing a part of major importance in R.A.F. expansion, Sir Kingsley Wood, Secretary of State for Air, last week inspected the Tolworth, Surrey, factory of Parnall Aircraft, Ltd., where he was initiated into secrets of some of our latest power-driven gun turrets, designed by Capt. Frazer Nash. He said: "I was particularly glad to have the opportunity to-day of visiting, with other members of the Air Council, the experimental works of the Parnall Aircraft Company at Tolworth, and of seeing the work that they are carrying out on various types of turret. The high speed of modern aircraft makes it impossible for air gunners to continue to operate their guns manually in open cockpits as of old, and it is now necessary to cover in cockpits and to provide means for training the movable guns. I believe that thanks in large measure to the great technical ability and inventiveness of Capt. Frazer Nash, we have in this country largely succeeded in solving this problem, and, indeed, in outstripping other countries in the design of mechanically operated turrets."

Details of the devices shown to Sir Kingsley Wood are still very much secret. Two R.A.F. official photographs, however, have been issued to the Press and a certain amount of information may be derived from these.

(*Continued on page* 105.)

SERVICE AVIATION (CONTINUED)

One, reproduced on page 104, shows a four-gun turret of the type which might be installed in the tail of a big bomber or flying boat. The guns appear to be belt-fed Brownings (hitherto all free guns in the R.A.F. have been of the drum-fed type) which must demand ingenious feeding arrangements in view of their compact grouping. The turret is apparently "steered" by a handlebar arrangement similar to that on the Demon-type armoured "shell-back" turret referred to in *Flight* as long ago as May, 1937, when a member of the staff was able to fly in an experimental Demon at Martlesham.

A turret of this latter type, fitted with a single Lewis gun and optical sight, was also shown to Sir Kingsley Wood.

Military Engines

THE visionary writing of Mr. M. Golovine is happily wedded to the traditional Rolls-Royce excellence of production in a welcome little publication, *Some Notes of Modern High-Performance Engines*.

In true Golovine style the first line of the text states that the main characteristics of modern military aircraft are speed and armament. Thereafter a study is made of the problem of optimum performance by analysing the characteristics which are particularly important in the case of an aero engine intended for military aircraft—especially fighters.

It is assumed that a modern fighter attains a speed of the order of 300 m.p.h. at altitudes of over 18,000ft., the latter being governed by the increase of operational height of modern bombers—a direct outcome of progress made in anti-aircraft gunnery in the course of the last few years.

In considering frontal area great importance is attached not only to aerodynamic refinement and vision, but to the possibility of armour plating. It is argued that only one method of attack will prove efficient—a dive from a height of 3,000-5,000ft. above the bombing units. Experience in the Spanish War has shown that the defensive fire of the bomber *along its axis of flight* is quite accurate. It is often claimed that a radial engine affords protection to the pilot of an attacking fighter but the R.R. publication opines that a modern steel-core 0.5in. bullet will inevitably put the engine out of action. It is therefore concluded that the engine cowling must be armoured and it is claimed that "in line" "V" or "H" engines are comparatively easy to protect, for owing to the inclination of the cowling to the line of flight of projectiles thickness of the plate can be reduced very considerably. The provision of half an inch of armoured steel all round the cowling would be unnecessary; ¼-⅜in. would be ample to protect the engine against bullets of large-bore machine guns. Radiators can be protected or else concealed in the fuselage and petrol tanks behind the engine and under the armoured cowling would be fairly safe from incendiary bullets which have a comparatively low piercing power. To complete the protection, the back of the pilot's seat could be made of armoured steel and light protection provided around the cockpit to stop shell splinters and bullets hitting the fuselage at an acute angle. A steel spinner, of course, would be fitted and the airscrew blades would have to be capable of withstanding bullet impacts.

References are made to the use of fighters against ground targets, entailing the running of supercharged engines at full throttle below 1,000ft.

Information is included on the latest Rolls-Royce vee-type liquid-cooled engines, including the Merlin II, Merlin X and Peregrine. The Peregrine, like the Kestrel, has a bore and stroke of 5 x 5.5in., and a swept volume of 21.2 litres. Other data are: normal r.p.m., 2,850 (the highest yet recorded for any Rolls-Royce production type engine); normal output, 860 h.p.; rated altitude, 13,500ft.; dry weight, 1,106lb.; specific weight, 0.81lb. h.p.

For comparative purposes a monogram, intended for quick estimation of theoretical full-throttle ground powers, according to the output at a given height, is included.

Figures for the Merlin R.M.2 S.M. two-speed supercharged engine, operating on 100-octane fuel are: International power, 1,135 h.p. at 15,500ft.; maximum power, 1,145 h.p. at 16,750ft.; and approximate ground level potential power (maximum), 2,040 h.p.

Air Observers

AN Air Ministry order gives some further details about the conditions of service of air observers and air gunners. In last week's issue of *Flight* the case of direct-entry air observers was described.

Air gunners will be chosen from airmen already serving in the trade of wireless operator who have joined the Service as boy entrants. After about three years' employment on crew duties, some air gunners may be selected for training as air observers, and after training will be promoted to sergeant. After completing eight years' man service, an air observer will normally be allowed to re-engage to complete a total of twenty-four years. A limited number of air observers will be granted commissions, and become officer observers.

The observer's badge, of the letter O with a single wing attached to it, will be worn by air observers after they have passed their course, served in a squadron as observer for six months, done fifty hours' flying as observer, and been recommended by the C.O.

After three years' service, a proportion of the observers will be selected for training as airman pilots.

Flying Accidents

THE Air Ministry regrets to announce the following accidents:—

With reference to the disappearance on January 23 of an aircraft of No. 10 (Bomber) Squadron, Dishforth, Yorkshire, extensive searches having failed to find the aircraft and its occupants, it must now be accepted that the following personnel lost their lives on that date: P/O. Frederick William Miller (pilot), P/O. Allan Frederick William Miles, Sgt. Horace Cutts, A/C.1 Harry Thompson, A/C.1 Ralph Lavery, A/C.1 John Robert Hanley.

Sgt. James Thomas Wyse (pilot) lost his life and L.A/C. Edward Lawrence Wade was slightly injured in an accident which occurred at Sutton Bridge on January 24 to an aircraft of No. 3 Armament Training Station, Sutton Bridge, Holbeach, Lincolnshire.

Royal Air Force Gazette

Royal Air Force

General Duties Branch

Flt. Lt. A. G. Strutt is granted a permanent commission in that rank (January 6).

The following Flying Officers are promoted to the rank of Flight Lieutenant on the dates stated:—M. H. de L. Everest (January 3); D. C. Torrens (Acting Flight Lieutenant) (January 16).

The following Flying Officers are granted the acting rank of Flight Lieutenant on the dates stated—F. W. Flood (November 17, 1938); M. P. Skinner (January 2).

Cdr. A. P. Colthurst, R.N., is re-attached to the Royal Air Force as a Wing Commander with effect from January 1, and with seniority of September 1, 1938; Capt. A. A. N. Malan (Royal Tank Corps) is re-seconded for duty with the Royal Air Force as a Flight Lieutenant with effect from January 16, and with seniority of January 16, 1937; Flt. Lt. H. S. Laws is transferred to the Reserve, Class A (January 23).

Equipment Branch

The following Flying Officers (Acting Flight Lieutenant) are promoted to the rank of Flight Lieutenant (January 8):—E. G. Ambridge, A. R. Morton.

Chaplains Branch

The Rev. J. M. Scutt, M.A., is granted a short-service commission with the relative rank of Squadron Leader (January 13).

Royal Air Force Reserve

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

The following are granted commissions in class CC as Flight Lieutenants on the dates stated:—C. W. Black (October 8, 1938); Flt. Lt. R. C. Bryant, R.A.F.O. (November 4, 1938); Capt. F. M. St. H. Evans (November 7, 1938); Major K. S. Grove (November 14, 1938); Capt. A. T. Wynyard-Wright (December 5, 1938).

F/O. (now Flt. Lt.) E. F. Wain, R.A.F.O., is granted a commission in class CC as Flying Officer with effect from May 7, 1938, and with seniority of April 1, 1938, and as Flight Lieutenant with effect from October 1, 1938 (Honorary Flight Lieutenant with effect from September 5, 1938); Sqn. Ldr. (Honorary Air Comdre.) B. C. H. Drew, C.M.G., C.V.O., C.B.E. (Air Commodore, R.A.F. Ret.), is granted the rank of Wing Commander (Honorary Air Commodore) (October 7, 1938).

Equipment Branch

Flt. Lt. J. C. Shakeshaft (R.A.F. Ret.) is granted a commission in that rank in class CC (October 17, 1938).

Royal Air Force Volunteer Reserve

Medical Branch

F/O. A. Ronald, M.D., F.R.C.S., is promoted to the rank of Flight Lieutenant (August 26, 1938).

Auxiliary Air Force

General Duties Branch

Flt. Lt. J. C. Walker relinquishes his commission (August 3, 1938).

No. 501 (COUNTY OF GLOUCESTER) (FIGHTER) SQUADRON.—Flt. Lt. C. N. Shaw relinquishes his commission (May 30, 1938).

No. 600 (CITY OF LONDON) (FIGHTER) SQUADRON.—Flt. Lt. I. R. Campbell-Orde relinquishes his commission (December 10, 1938).

Medical Branch

No. 905 (COUNTY OF SURREY) (BALLOON) SQUADRON.—R. G. Smith, M.R.C.S., L.R.C.P., is granted a commission as Flight Lieutenant (November 3, 1938).

No. 907 (COUNTY OF MIDDLESEX) (BALLOON) SQUADRON.—J. Aitken, M.B., Ch.B., is granted a commission as Flight Lieutenant (November 22, 1938).

Auxiliary Air Force Reserve of Officers

General Duties Branch

I. Ridley Campbell-Orde is granted a commission as Flight Lieutenant in Class A, with effect from December 10, 1938, and with seniority of July 18, 1934.

Owing to the greatly increased length of these lists, as a result of R.A.F. expansion, ranks are confined to those of Flight Lieutenant and above.

PRESENT TRENDS in RADIO

The Problems in Europe : Combine facilit... From Blind Approa... Bli...

By H. ...MUELS...

THE increases in commercial operating speeds and in service frequency have placed a heavy load on those responsible for organising the various radio services which are so necessary for all-weather flying. The economic, financial, and political difficulties faced by them are severe, and criticism to the effect that the development of the radio facilities has not kept pace with air transport technique is not entirely justified.

There is, in fact, a growing opinion that the useful limit of purely radio development has been reached and can only be maintained whilst aircraft designers produce machines which are easier to handle under adverse conditions. Certainly, at the present moment it is one man's skill and experience only which brings some 15 tons of assorted ironmongery and passengers to earth at an "approach speed" of approximately 100 m.p.h. Think, then, of the poor control officer trying to give QGPs to four or five aircraft flying blind and cruising at some 150 m.p.h. within a radius of twenty miles of the airport.

The old system did not work too badly ten years ago, but is now defeated by (1) speed, (2) air traffic density. In those days "individual attention" was the motto of the ground services, and there was even time for an unofficial "Good morning" or "Thank you." Now, air radio operators have almost to queue up to obtain a departure message or position report, and the navigator's C.D.C. is working overtime though in effect lagging about five miles astern.

Luckily for all concerned, the "one man band" is becoming something of a rarity, and probably only the small operating company will regret its passing. It certainly is not safe nowadays to have the duties of pilot, radio operator, and navigator all assigned to one man.

Classifying Duties

The ground radio stations in Europe perform a multitude of duties, and it may be interesting to classify these broadly and endeavour to guess the trend of their development or replacement. In the space available for this article only European conditions are reviewed, since transatlantic and Empire routes have their own special problems.

(1) *Point-to-Point Services.*—Almost continuous communication is required between major aerodromes, this communication dealing with such diverse subjects as departure messages, aircraft positions in the area, bookings, meteo reports, and the all-important air traffic control procedure. From the engineering point of view there is no particular difficulty in arranging all this, since radio equipment, telegraph, telephone, and teleprinter all play their part, often in combination.

It is, for the most part, a matter of providing a sufficient number of communication channels of one type or another, and any new invention which conserves the all-valuable ether spacing is to be encouraged. For instance, a wider application may be found for the new multi-channel short-wave radio links which are now in service in several places. Provided that reliability and speed can be ensured, the flying personnel are not concerned with this section of the aviation communication problem.

(2) *Meteo Services.*—The collection of weather reports is the subject of international agreement, and consists principally of arranging for local reports to be sent to the main area station so that an overall picture may be obtained. From this the forecasts are made, so that on demand local reports as well as period forecasts are available. The process of collection is a straightforward communication problem, and where radio transmission is employed it is sometimes possible for aircraft to listen-in and obtain information some time before the main station is ready to re-transmit it.

Until a year or two ago weather reports from main aerodromes were only obtainable "on demand," but this practice led to needless repetitions at quite short intervals. Recently, therefore, it has been made a practice for the major airports to broadcast at fixed intervals—usually 30 minutes—the local weather report. This is done on the aircraft receiving watch frequency, and proves sometimes to be rather a mixed blessing owing to the jamming created thereby. Even if a separate frequency channel were available, it would mean that the aircraft radio operator would have to go off watch to receive this special transmission—which, under the crowded air conditions in Europe, is not to be encouraged.

It is rather a pity that the radio telephony broadcast system has not been expanded further, on a different frequency if necessary. The Borough Hill (Daventry) transmissions on 245 kc/s can be very valuable both for commercial and private-owner flying and for airport use. In order to overcome the medium-frequency jamming problem, such transmissions could be arranged for on about 3,000 kc/s at regular intervals on an international basis in much the same way as the triangulated D/F beacon service has been set up.

I should be interested to know the percentage of air-to-ground or ground-to-air messages dealing with meteo matters. Probably it is fairly high, so that any system encouraging the provision of ready-made information and minimising two-way communication is to be commended.

(3) *Ground-to-Air Service.*—The major problem encountered here is one of scarcity of com-

"*Flight*" *photograph.*

Apart from the fact that the control and radio departments are installed in a tall tower which gives a complete view of the landing ground and its environs, Liverpool airport is interesting also because it is the only one in this country with a medium-wave approach beacon system. This photograph shows the inside of the wireless room in the tower.

At Croydon there are three two-way D/F channels. Two of these are for normal work, while the third is for controlled-zone operations at a comparatively short range. The installation for the latter is seen on the right, while beyond the glass partition is the control office.

IOSERVICES

ombine acilities : High-frequency Developments : Approa Blind Landing

By H. MUELSON*

munication channels in the medium-frequency band allotted to the aircraft services. This has been the subject of numerous international conferences, where the broadcasting and other interests have been fought to the last kilocycle.

The existing ground-to-air organisation was at first set up round about 333 kc/s, because this gave greater certainty of communication as compared with the higher frequencies, the "skip distance" effects of which were only just beginning to be understood. Furthermore, direction finding in this band gave relatively good results except for night effect, and, since regular night flying was practically unknown, this did not matter very much. The result was that the dual services of communication and direction finding have been virtually merged as regards frequency bands.

High-frequency Developments

In the light of present knowledge on two-way communication alone, more use could be made of higher frequencies if this service could be divorced from direction finding. It is true that even the 6,000 kc/s region is rapidly filling up—especially with the growing needs of the military, air, and naval forces—but the experience gained by the airlines in the U.S.A. and on our own Empire routes shows that the situation here is certainly a great improvement over present European conditions.

(4) *Navigational Services.*—For providing assistance in navigation three main systems are at present in use:—

(*a*) Direction-finding receivers at airports.
(*b*) Ground beacons emitting definite track signals.
(*c*) Ground beacons emitting omni-directional signals.

(Broadcast stations are to be considered as being in this category.)

Each system has its advantages and disadvantages, so that it is possible, if only on grounds of security, that all three methods will be retained in improved forms.

D/F airport receivers have been undergoing steady improvement and show no signs of reaching finality in design. Progress on medium-frequency equipment has centred round the elimination of night errors and other transmission phenomena. Variations of the Adcock aerial system form the principal theme round which such refinements as remotely located receivers are built. Sensitivity and accuracy are now of a high order once difficulties in choosing the best site have been overcome.

However, there still remain the troubles of interference and density of traffic so long as the medium frequencies are retained. The interference trouble can be minimised by the use of higher-grade aircraft transmitters, *e.g.*, with crystal control, which would enable the ground receiver to work at its highest selectivity

The traffic problem is by far the most severe, since, irrespective of technical considerations, there is a limit to the number of machines which can utilise a single communication channel, especially when bearings have to be transmitted back on medium frequencies.

High-frequency ground direction finders now form the subject of research by both civil and military aviation radio organisations, each of whose problems have much in common with the other.

It is an accepted principle that it is desirable for most of the work in connection with direction finding to be done on the ground, since conditions there are easier and so encourage smooth operation and accuracy of results. The machine, also, should carry the minimum amount of radio apparatus, whether it is a single-seater fighter or an airliner. Unfortunately, the necessities of commercial and military secrecy do not permit of any description of current experimental work in such weight reduction, but it can be said that high-frequency D/F work is making rapid strides. There is no very basic difference between the problem involved in bringing in three or four airliners under ground D/F control and that of bringing in a flight of heavy bombers during QBI conditions.

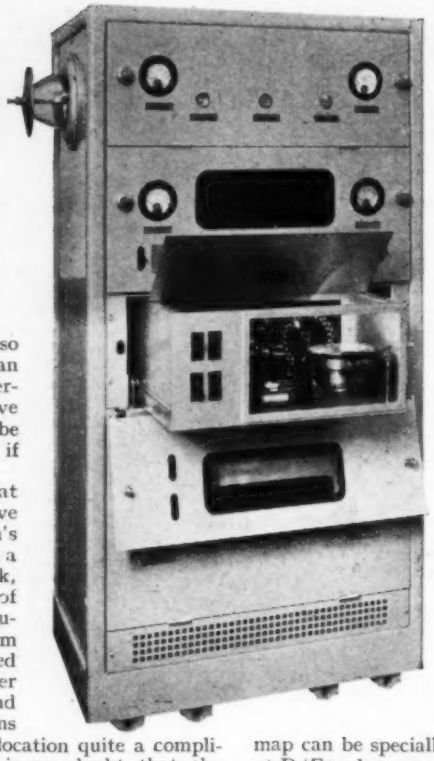
Track Beacons

When high-frequency direction finding becomes an established practice it will probably result in a corresponding increase in the communication-channel frequencies, the present band being reserved for omni-directional beacons, which will be considered later in this article.

The United States has always been the exponent of the equi-signal track system, but their faith therein has been rather rudely shaken during the last few years. The fitting of D/F receivers in the machines has been demanded by the authorities as a stand-by device, and the fact that the receiving loops can be made in anti-static form has provided a useful alternative means of reception of the medium-frequency beams.

In its perfected form (at present unknown) the equi-signal beam has a number of valuable features. A simple

* *Technical Sales Manager, Smith's Aircraft Instruments.*



In order to reduce the congestion and the amount of work being done by ground D/F stations, there is a tendency nowadays to make use of automatic omni-directional beacons for navigational purposes. At the moment transport crews flying between London and the Continent have the use of three of these—at Mitcham, Le Bourget and Schiphol (Amsterdam)—for position-finding purposes. This is an example of code-sending omni-directional beacon produced by Standard Telephones.

receiver provides the pick-up, so that any number of machines can use the track without radio interference. Marker beacons can give "spot" positions, and speech can be superimposed on the transmission if required.

In spite of these good features, at least two serious drawbacks have rather upset the faith of the system's warmest adherents. First, once a pilot gets off the equi-signal track, whether voluntarily, because of storms ahead, or by drift miscalculation, there is nothing to tell him how far off he is from his desired path. The proximity of other beacons on different frequencies, and the fact that practically all beacons give four courses, makes positive location quite a complicated business. Secondly, there is no doubt that the beams "swing" and produce queer kinks and false courses, especially in mountainous country.

An interesting innovation is now being tried in Australia and discussed in the U.S.A. This is the use of V.H.F. equi-signal beacons on the Lorenz principle. It has been known for some time that the distance of reception of the V.H.F. beacon is practically proportional to the height of the machine, and the fact that operating heights are increasing may contribute to the success of the experiment. The radiators of the long-range beacons are more elevated than those of the original Lorenz landing beacons, so it is hoped that the influence of ground conditions will not be so great. From 33 megacycles upwards a large number of beacons can be operated without interference troubles, even if their back radiation is utilised, with comparatively small spacing of carriers.

Irrespective of whether frequency and constancy troubles are overcome, one objection to the track system remains, and that is the risk of losing the beam. Admittedly, a standby D/F receiver on the machine will assist the crew, but in the barren parts of Australia, at least, suitable medium-frequency transmitters are few and far between. On the other hand, there are not likely to be many parallel or crossing courses—at least for some years to come—so that errors in identification are less likely. It may be, therefore, that the V.H.F. track beacon will prove to be the best for one given set of conditions, whilst high-frequency D/F ground systems are best for the others.

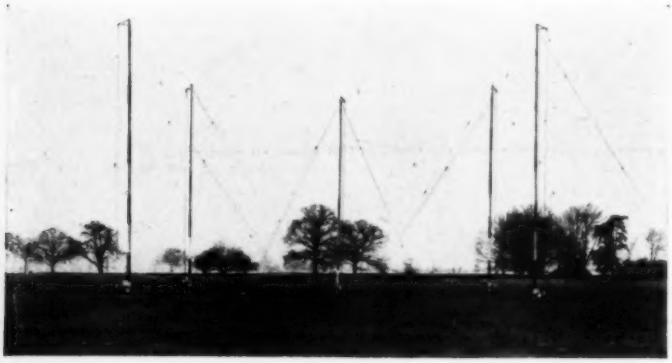
Omni-directional beacons of the long-range or localiser type, working on medium frequencies (*circa* 263 kc/s), are a recent innovation, and their success depends more on the aircraft receiving equipment than on the transmitter as such. The triangulated system has been very carefully worked out so as to cover the needs of the major air routes. Speed of obtaining results is vitally necessary when trying to get a "fix," and the present length of transmission of one station and the interval before obtaining the result of the next one are thought by some people to be too long in view of modern cruising speeds.

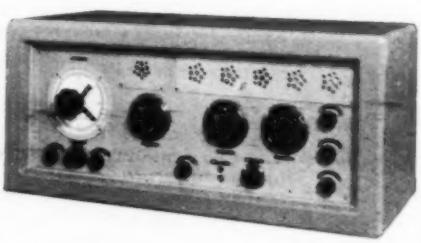
Again, it appears that the use of two systems is likely to be the ultimate answer. For instance, a bearing from the airport ahead can be obtained through the ground D/F system in order to check the track, whilst a "cut" can be got from a beacon (or a broadcaster) to one side of the track. For a given route a map can be specially prepared with compass roses marked at D/F or beacon stations, with bearing lines drawn off to intersect the track at convenient intervals.

There is no doubt that the advent of the beacons has relieved some of the load on the ground D/F organisation, but so far no equivalent of the Adcock aerial system is available for aircraft fitting, so that "night error" and similar effects have still to be contended with. Possibly some experiments with a vertical type of "anti-fading" aerial at the beacon may be worth while in view of the promising results from this type at some of the major broadcasters. In any case, since night flying is now a regular institution, the elimination of errors at the transmitting or receiving end is a necessity and should receive immediate attention.

(5) *Close-approach and Landing Aids.*—At the present moment aircraft can take off in fog, fly in or above fog, but cannot land with any degree of certainty when the visibility is less than 100 yards or so. Until such a time as aircraft are designed with a speed range of the order of ten to one, radio development must proceed for the assistance of the conventional type of machine.

The ultra-short-wave approach beacon has been standardised in Europe, and the various interpretations of it by Lorenz, Telefunken, and other firms give the same result so far as the pilot is concerned. Since the introduction of





By way of combating night and other errors, the Adcock type of aerial system (shown on the left) is now used at the majority of aerodromes for direction finding other than that involved merely in homing or making "ZZ" approaches. Above is the receiver concerned.

The disposition of this country's radio control areas, each of which is in charge of a main station. Until comparatively recently only the Croydon, Heston and Portsmouth areas were specially defined, but during 1937 the Manchester (West) area was introduced in order to cope with the amount of traffic over the Irish Sea.

the system opinion has changed somewhat as to the risk of interference between adjacent systems, the practicability of the glide path principle, and the width of the beam.

So far as Great Britain is concerned, it is probable that three or four different frequencies will be used, Croydon staying on the present "international" frequency of 33 megacycles. The primary value of the system now appears to be recognised as giving the clearest line of approach to the airport, together with two "spot" positions, both the actual approach from the first marker beacon and the landing being accomplished by instrumental observation and not radio means. The beam being a diverging one, the width of the equi-signal zone is proportional to the distance from the origin, and if an approach is started too far away, exactly in the centre of the beam, there is a risk of zig-zagging between the dot and dash zones. Hence the fact that the majority of pilots prefer to fly on the threshold of the beam—*i.e.*, where the dots or dashes just begin to merge into the continuous note, and, consequently, where any deviation from the track is immediately noted.

A recent development of the Lorenz system has been tried by Lufthansa, and consists of the use of a third marker beacon, about 25 km. from the main beacon. In some cases this is to be supplemented with a miniature medium-wave omni-directional beacon the transmission of which can be used for "homing" by means of the D/F receiver on the machine. The idea is to provide, during QBI conditions, a rallying point outside the controlled zone where aircraft can be told to "stand off" whilst awaiting their landing turn. The third beacon also gives the pilot more time to adjust his height correctly over the intermediate beacon, which is usually a signal for the final approach.

It now seems generally accepted that the ideal to aim at for real landing aid is an indication of a virtually straight-line glide path, approximating to the natural gliding characteristics of an aircraft. A beam of such a nature is much easier for a pilot to follow, and simplifies the problem of a fully automatic blind landing, especially in combination with a tricycle undercarriage.

Intensive research in Germany, America, France, England, and elsewhere is now going ahead in order to achieve the straight-line approach. Several systems utilise horizontal radiators for the vertical guidance (glide path) beam, and it is claimed that the radiations from this type, as opposed to those from the vertical type, are immune from variations caused by the condition of the ground, and that they propagate a straighter field-strength pattern.

A new blind landing system made by Le Materiel Telefonique in Paris is shortly to be installed at Le Bourget after lengthy trials at Troyes, where pilots of Air France are now under training. The usual horizontal guidance is given by means of a transmitter on 33 megacycles (the "international" frequency) feeding a vertical radiator system, and the beam itself is only one degree in width for "on course" signals, which are made apparent by visual and aural means as in the case of the Lorenz receiver. When "off course," strong dots or dashes are heard, so that, at a distance from the beacon, there is little chance of wandering inside the equi-signal zone of the beam. The usual marker beacons are provided at the edge of the aerodrome and at a distance of 5 kilometres.

Refinements

For the glide-path definition an entirely separate transmitter is used; this operates into a horizontal aerial system and gives, substantially, a flat line of descent. These transmissions are picked up in a separate receiver aerial and circuit in the aircraft and are made visible through a vertically moving needle. Quite a wide tolerance is given in the movement of the needle in relation to the path to be followed, so that see-sawing down the beam is prevented. This landing beam flattens out sufficiently near the ground to permit of flying on without risk of "ballooning" provided that the speed is controlled within reasonable limits.

One advantage of this new system is that the two most interesting components, the landing beam beacon and the associated aircraft receiver, can be added to an existing blind-approach system of Lorenz or Telefunken type, such as now found at most of the major European airports. Thus no capital invested in existing plant need be thrown away, and, in effect, a refinement can be added. Similarly, if this new system is installed in its entirety it can still be used for directional guidance by aircraft fitted with the present type of V.H.F. receiver.

There seems little doubt that, ultimately, the fully automatic blind landing will become a normal event. By the time that the combined auto-pilot and radio system is perfected, an added safety factor may be given in aircraft characteristics where these affect normal approach and landing methods. Certainly there is something to be said for the theory that when flying is easier it will become safer; merely to mechanise everything at the present stage is rather begging the question of safety. The science of radio can always be called in to give assistance, but it must not be made entirely responsible for the solution of all its difficulties. Rather it is to be hoped that continual collaboration between air transport, aircraft design, and radio engineering will result in the real safety which is their individual aim.

Due to circumstances beyond our control, the article on Air Traffic Problems, announced as a feature of this number, is unavoidably held over until a future issue.

COMMERCIAL AVIATION

FAR EASTERN TERMINAL: The entrance to Singapore airport, with the terminal building in the foreground.

THE WEEK AT CROYDON

"A. Viator" Discusses Chimneys, Obstructions in General, and the Good Old Days

OPERATING companies at Croydon are discussing a circular letter which they have received from the Air Ministry. This says that the Croydon Council proposes to erect a 300ft. chimney some 2,173yd. from the nearest point of the airport boundary.

In a languid sort of way, it seems, the Ministry disapproves of the project for, "as a result of representations," the chimney, originally designed to be 350ft. high, has had 50ft. knocked off it.

This, no doubt, has saved some poor airliner captain from knocking the top fifty feet off it, and so far we may be forcibly grateful to our energetic Ministry, whose main function, after all, is actually to safeguard the interests of civil aviation.

Another cause the Ministry has for self-congratulation is the fact that the base of this gargantuan obstruction will be 43ft. below the lowest point of the aerodrome. As the lowest point of the aerodrome is, no doubt, a deep hole inhabited by a prolific race of mud frogs, it does not really help much, especially as there are quite nice-sized hills on the aerodrome. The Ministry ends its letter charmingly with the words, "In view of the proximity of the proposed chimney to the existing air routes, it is thought that your company would wish to be informed of the scheme."

In the past, the first, or almost the first, we knew of any pylon or chimney in building adjacent to the landing ground was the report from a pilot that he had met a steeplejack at 250ft. in thick fog, and that this artisan had been annoyed at being disturbed—to the extent of flipping a trowel of wet mortar into the cockpit window.

It is nice to be warned, and it may seem ungrateful to suggest that a 300ft. chimney is just the thing which should not be built, and should not be allowed to be built anywhere near an airport at a point where pilots are bound to be flying at a comparatively low height in order to get in and land, and where the cloud-base may often be 300ft. or lower.

Moreover, in poor visibility a pilot and crew have enough to do and enough anxiety (not forgetting the numerous other obstacles round Croydon aerodrome which a supine administration has either allowed to go up or neglected to have pulled down) without having to look out for 300ft. chimneys.

What was it which caused the recent lamentable accident at Cologne, when the pilot was an extremely experienced man, and how many other accidents have been caused by ill-sited chimneys? An extremely unsatisfactory feature of the affair is that there seems to be no indication, as I am informed in the Ministerial epistle to the companies, that strenuous efforts, vigorous representations, or even mild protests have been made to prevent the erection of this chimney.

Has any high official of the Air Ministry called on the Council to point out that, however important such a chimney may seem to be, the preservation of human life is more important? If, after such a warning, emphatically delivered by one in authority, the Council persisted in a scheme which placed the gravest responsibilities on their own shoulders, I should be surprised.

Meanwhile, with a perfect genius for getting hold of the wrong end of the stick, a Sunday newspaper asserts that Croydon is to be abandoned by air traffic concerns within the next few weeks in order to allow of levelling operations. What he means is: "Within the next few years, when Fairlop is ready."

But don't some of us wish we could abandon the place, especially as the competitive spirit of adjacent councils will probably cause an epidemic of chimneys on our borders, each taller than the last?

Specially Sown Grasses

Since International Air Freight ceased operations their American-built freight carriers have been housed in a remote hanger in a corner of the airport. A little "burrd" told me that these machines have now been purchased by no less dignified an establishment than the Air Ministry itself, and that the department concerned urgently desires to put them into the air as training ships, flying laboratories, or what you will. So far excellent. But that same Ministry (Directorate of Seeds and Pips), some months ago, went all agricultural-minded and a sower went forth to sow a huge area in front of the hangar in which the ex-I.A.F. planes were slumbering away the winter. Superhet grass seed was used, each individual seed, it is thought, having been personally inspected by Mr. Middleton and issued with a certificate of fertility. Dte. of S. and P. ordained that there was to be no traffic across the newly sown area for a twelvemonth, and officials obliged to visit the hangar walked on their hands so that nobody could accuse them of trampling on the grass.

So now the machines cannot be got out of the hangar, nor, incidentally, can any others get in, which is mystic and wonderful to think about in these days of congested hangars and lack of accommodation.

As I write there is a devil of a rattling noise outside my window. It is the sort of noise which might herald the

COMMERCIAL AVIATION (CONTINUED)

arrival of the *Rocket* at Euston Station. Looking from my window I see *Heracles* arrive from Paris. Shortly afterwards an Air France Bloch arrives—ask not when she left Paris—and draws up on the other side of *Heracles*, but what with the forest of spars and wires, the multiple tail unit and the bustling hedgerow of gadgets, I see the Bloch but dimly, as one gazing through a spinney.

Heracles actually has mudguards on his wheels—sweet, eh? And unsuspected portholes, postern gates and the like. Under his nose there is something closely resembling a portcullis half up and half down, and atop of the fuselage there seems to be, besides a cluster of little sticks, a genuine tin chimney such as you see on old-fashioned caravans. To tow *Heracles* they need a most impressive bit of ironmongery, a cross between Neptune's trident and a section of steel lattice such as that of which bridges are built.

For the first time in my life I have seen a man tapping an aeroplane wheel, just as they tap those of railway trains. It was the tail wheel he hammered; to get the towbar to fit, after which that gallant aeroplane moved off backwards to the hangar.

You think I am mocking at *Heracles*? Far from it, for splendid indeed is the safety record of that type of aeroplane and magnificent in its day was the standard of comfort set by it. It is not the fault of Imperial Airways that the *Heracles* type was not replaced years ago by something more modern and, mark you, it was this good old type which saw the company through and stayed in the air day and night when some of the new and heavily boomed types seemed to have let them down.

Hats off then to *Heracles*! Anyway, Imperial Airways need not worry about speed. The Frobisher class is able to compete with the fastest air liners on the air routes to-day.

Further East

IMPERIAL AIRWAYS have recently concluded an agreement with the Chinese Government for the operation of a through passenger and mail service between Europe and Yunnan. This service involves an extension of the present route to Hong Kong and the flights to Yunnan will be made in pool by Imperial Airways and China National Aviation Corporation. The latter already make this run.

Merger in Australia?

THE creation of a single operating company to be formed by a merger of all the present companies is being unofficially discussed in Australia. Apparently several Federal Ministers are in favour of the project, which may shortly be dealt with by the Cabinet. Overtures have not been made to the different companies, but most of these have indicated that they would be willing to enter into a discussion.

Needless to say, such a merger would provide the advantages of unified control, the abolition of unnecessary competition, and a general improvement in airline economics in Australia. It is possible that the Government will eventually apply the necessary pressure as a matter of national policy.

Christmas Aftermath

NOT many people realise what a comparatively large part was played by Service machines and pilots in the handling of the tremendous loads of Christmas mails on the Empire routes. Altogether Royal Air Force machines flew a matter of 29,000 miles, operating one service from Plymouth to Penang, two from Alexandria to Kisumu, Kenya and return, and seven from Alexandria to Lake Habbaniyeh, Iraq and return.

Among the flights made by specially chartered machines (which covered a distance of 152,000 miles) were those between Darwin and Calcutta by a Douglas D.C.3, taken over for the purpose from Australian National Airways. Altogether the various machines carrying the mail covered, during the Christmas mail period, a distance of 1,158,000 miles.

Air Service to Cairo

IN *Flight* of January 5, it was explained that Air France would shortly open a new service between London and Cairo. The inaugural run actually started last Saturday, when the Air France long-distance service to Hong Kong was transferred from its present route, via Naples, Castlerosso, Corfu and Beyrouth, to a new overland route, via Tunis and Cairo. Previously passengers have left flying-boats at Beyrouth and motored to Damascus before continuing their journey by landplane. The new route has been made possible by the introduction of Dewoitine 338 landplanes which will be used over the whole distance. The service goes on a permanent basis on February 9.

Contact at Heston

FOLLOWING the installation of flush or "contact" runway lighting at Ringway airport, work is now going ahead on similar lines at Heston.

This work, in order that airline operators and private owners may not be unduly curbed, will be carried out in three sections, each section being completed before the following one is started. The first, which lies between the inner marker beacon on the eastern boundary of the aerodrome and a point some two hundred yards east of the circle, will be completed towards the end of February, while the other two sections, running between this point and the main blind-approach transmitter, should be finished early in March.

During the operations the special facilities provided for use in connection with the "ZZ" procedure at Heston will not be applicable, and, at the same time, the ultra-short-wave beacons will be out of action. In the meantime all bearings and "motor" signals will be given, as before, from the control tower.

The contact lighting strip is being laid out, as may be gathered, on the blind-approach line, and the sections on which work is being carried out will be marked in the usual way by red flags during the day and by red lamps during the night.

TWO IMPERIAL APPOINTMENTS

On the left is Capt. L. A. Egglesfield, who left England last Friday to take up the new appointment of Deputy-Director of Civil Aviation in India. After serving in the R.A.F. he joined Imperial Airways in 1930 and was one of the first pilots to take charge of an Empire boat. During 1937 he surveyed the African, Indian and Singapore routes.

Last week Capt. L. A. Walters (right) was appointed to the command of Imperial Airways' flying personnel under the title of Establishment Officer, Navigating Staff. Capt. Walters is one of our oldest commercial pilots. After war-flying service, he joined the Handley-Page company in 1923 and was, in 1924, one of Imperial's original pilots. Since September, 1935, he has been Deputy Air Superintendent at Croydon.

COMMERCIAL AVIATION (CONTINUED)

New Service in India

AT the beginning of this year Air Services of India opened a new line between Kolhapur and Bombay, and the service was officially inaugurated by the Maharaja of Kolhapur, who has shown considerable interest in the project and offered a subsidy to the company, apart from arranging for the necessary aerodrome facilities in his capital. The service at present operates three times a week, and the company hopes to extend it in due course.

Co-operation in the U.S.

EASTERN AIRLINES recently came to an agreement with United Airlines for the use of the latter's machines and personnel when Eastern's traffic was reaching its peak.

United has, in fact, released four of its D.C.3 Mainliners and a number of co-pilots and mechanics to E.A.L., who have used, and will use, the machines on the well-patronised New York-Miami service during the winter months. In April, when United put their additional schedules on the New York and San Francisco services, the machines and personnel will be returned. That is obviously the way in which airline companies should work; no single company can economically carry the equipment necessary for dealing satisfactorily with occasional peak periods.

An Australian D.C.A.?

ON February 7, when the Australian Cabinet meets in Hobart, a Director-General of Civil Aviation for Australia will be appointed. Previously the work concerned has been carried out by the Controller-General, a position held by Capt. E. C. Johnston, and until the new appointment Mr. M. W. Mahaffey will be Acting Director-General.

The names of those who are likely to be considered for the post include Mr. Hudson Fysh, managing director of Qantas Empire Airways, who has recently been in London; Capt. P. G. Taylor; and Mr. Clapp, chairman of the Victorian Railways Commissioners. Since Mr. Hudson Fysh has his hands full with the Empire and other air services, and Capt. Taylor has no executive experience, it is generally considered that Mr. Clapp will obtain the position.

Ultra-short-waves Down Under

DURING this month Australia's first ultra-short-wave transmitter is expected to be in full operation at Essendon, Melbourne. Tests have now been carried out there and at Mascot (Sydney), Nhill and Canberra, while ground tests have also been completed at Kempsey (N.S.W.) and Brisbane (Queensland).

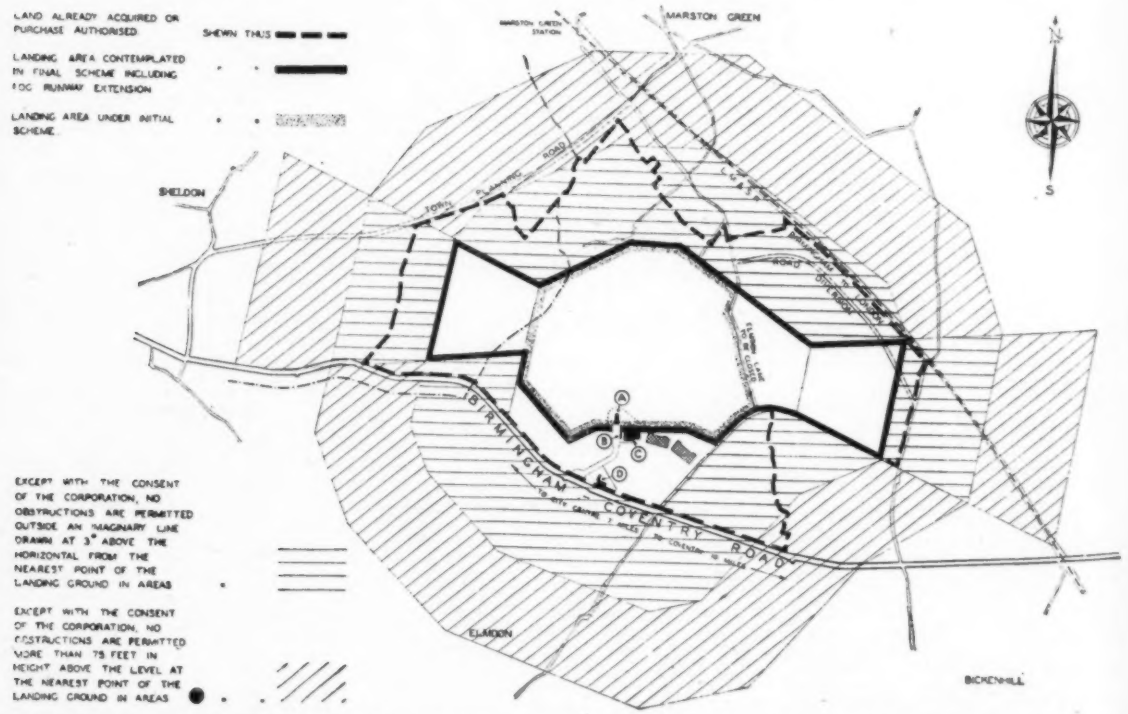
It will be remembered that the authorities in Australia propose that these ultra-short-wave beacons should be used for serious inter-airport navigation as well as for approach purposes, and the trials have indicated that the range of the transmitters is well in excess of the stipulated hundred miles—at least, when the machine is flying at a height above that normally used. No signs of distortion of the beams have been noticed, and no fading at night reported. The first batch of receivers is now being installed in various transport aeroplanes.

Big Extensions at Cannes

BY the end of next month Cannes aerodrome will be ready to receive large airliners, and the Marcel Blochs and Dewoitines of Air France will be able to land there on the company's Riviera service.

Up to the present the aerodrome at Mandelieu has been too small for the newer and faster types used by Air France, and a shuttle service between Marseilles and Cannes has been run with Wibault Golden Clippers. The present area of the airport is 350,000 square metres and this is being increased to 650,000 square metres by the acquisition and filling in of an adjoining lake. But this is not the ultimate scheme. The French Government have decided to enlarge it still further, to a total area of over a million square metres—1,100,000 to be exact—and to use one side of the aerodrome for Service flying training—news that will probably be greeted with mixed feelings by the commercial pilots. Barracks are to be built for a squadron which will be permanently stationed there.

Many of the services to the East may stop at Cannes instead of Marseilles; the airport of Marignanne is 16 miles from that city, as compared with the short motor run from Mandelieu Airport into Cannes.


LAND ALREADY ACQUIRED OR PURCHASE AUTHORISED. SHEWN THUS
LANDING AREA CONTEMPLATED IN FINAL SCHEME INCLUDING 100 RUNWAY EXTENSION
LANDING AREA UNDER INITIAL SCHEME
EXCEPT WITH THE CONSENT OF THE CORPORATION, NO OBSTRUCTIONS ARE PERMITTED OUTSIDE AN IMAGINARY LINE DRAWN AT 3° ABOVE THE HORIZONTAL FROM THE NEAREST POINT OF THE LANDING GROUND IN AREAS
EXCEPT WITH THE CONSENT OF THE CORPORATION, NO CONSTRUCTIONS ARE PERMITTED MORE THAN 75 FEET IN HEIGHT ABOVE THE LEVEL AT THE NEAREST POINT OF THE LANDING GROUND IN AREAS
MARSTON GREEN
SHELDON
BIRMINGHAM
COVENTRY ROAD
ELMDON
BICKENHILL
N
S

PREPARING FOR THE FUTURE: The zoning scheme (described on pp. 96-98) as applied to Birmingham Airport: A special Bill was promoted to control not only the heights of any new buildings in the marked areas, but also to give power to deal with the already existing obstructions in these areas. The Birmingham Corporation is now able to control all building operations within 3,000ft. of the landing area; the actual restrictions imposed are indicated in this plan. The estimated cost of the initial Elmdon scheme, including the purchase of the land, is £362,000, and the aerodrome should be available for use by May 1.

The AIRPORTS EXHIBITION

A Detailed Guide to the Exhibits at the A.O.A. Show Now in Progress

The Central Hall, Westminster.

THE planning, construction and completion of a modern airport, with all its paraphernalia of buildings and equipment, is becoming a very specialised business. The days of a shed, a windsock, a telephone, and a few gallons of petrol are over so far as concerns an aerodrome suitable for regular, or even spasmodic, air traffic, although the need for landing grounds with that simple equipment is as great as ever. This is, of course, particularly so when the ground is used but rarely, and then by small and lightly loaded aircraft, such as are used by the private owner or the air taxi concern.

In connection with the Airports Conference there was opened yesterday, at the Central Hall, Westminster, London, an exhibition of airport equipment at which 54 firms are represented. Their exhibits are detailed in the following pages. It may appear surprising that the products of so many concerns should be employed in connection with airports, their preparation and equipment. Yet the tale does not end there. There are many more firms which manufacture or deal in aerodrome materials or accessories, and the products of fifty-odd companies under this heading are reviewed in a special section (pages 121-124) following this Exhibition guide.

From our review of this branch of the aircraft industry it is obvious that, no matter what is the nature or magnitude of the calls made upon it in the future, the British industry is fully capable of meeting all requirements.

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Aerograph Co., Ltd. (Stand 35), Lower Sydenham, London, S.E.26.—"Aerograph De Vilbiss" spray-painting equipment, equipment of special interest to aerodrome owners, includes:—

Type MBC spray gun.—Particularly suitable for aircraft dopes, and claimed to be capable of applying these materials at higher speeds and with greater efficiency than has previously been possible.

Pressure feed tanks enable large quantities of the same kind of material to be sprayed continuously without waste of time and material.

An air transformer is an indispensable item of equipment in any spraying installation as it provides the clean, dry air which is so essential for doping and it also enables the operator to adjust the air pressure at the spraying point.

Portable equipment.—The Aerograph Type P.W-1 plant is extremely compact and portable, being mounted on two 20in. pneumatic-tyred wheels, yet incorporating a twin-cylinder air compressor of 7 cu. ft. displacement.

Stationary air compressors.—There is a complete range of Aerograph air compressors to suit all requirements; they are renowned for high volumetric efficiency, dependability and long life.

Exhaust fans.—Aerograph direct-coupled propeller exhaust fans are manufactured in many different sizes and incorporate Buxton certified flame-proof motors to comply with all paint shop regulations.

Air Industrial Developments, Ltd. (Stand 10), 62-4, Brook Street, London, W.1, and Shenstone, Staffs.—All types of compressors and spray-painting equipment, both portable and stationary models, may be seen on this stand.

Compressors are manufactured in sizes from 2½ to 100 cu. ft./min. and are of simple and robust design. 15 cu. ft./min. and over are fitted with full pressure-feed lubricating system. All machines of 30 cu. ft./min. and over are of the radial two-stage type. A high-pressure water-cooled machine is also manufactured, suitable for working pressures up to 800 lb./sq. in. This is very popular with manufacturers for such duties as testing oleo legs.

Automatic compressor plants.—A range of completely automatic plants with direct mounting on to a horizontal air receiver may be obtained from 2½ cu. ft./min. to 100 cu. ft./min.

Portable compressor plants.—A range of standard units from E.P.1, claimed to be the smallest and lightest plant of its type on the market up to 100 cu. ft./min. diesel-engine-driven units. With the exception of the E.P.1, all models are suitable for working pressures of 100 lb./sq. in. and are supplied with petrol or electric motors. Particular attention is drawn to the T.1.3.

Spray guns and painting equipment.—A complete range of the famous Binks spray guns are exhibited. They are widely used by manufacturers both here and in U.S.A.

Air transformers and filters, paint pressure containers, reducing valves and other equipment for the spray application of paint and aeroplane dope are exhibited.

Ash's Manufacturing Co. (Blackfriars), Ltd. (Stand 38), 60-66, Blackfriars Road, London, S.E.1.—This exhibit will take the form of a display of photographs of works and staff canteen installations.

A comprehensive 100-page sectional catalogue containing data on equipment of all types will be available on the stand, and an expert in canteen planning, etc., will be in attendance. The firm has completed canteen installations in all parts of the country, both in aircraft factories and in many other types of industrial concerns.

B.B. Chemical Co., Ltd. (Stand 30), Ulverscroft Works, Leicester.—Bostik industrial adhesives are a series of water-resisting compounds which retain a certain amount of resiliency so that they do not dry up or powder. They are used in the aircraft, building and similar industries for all types of work where a durable water-resisting adhesive or sealing compound is required. The principal grades are:—

292, Bostik universal cement, for sealing windows into metal frames and sealing metal frames to masonry so as to produce a completely water-resisting seal. It is used extensively for glazing in aircraft construction.

292C. Bostik cement, for sticking rubber, linoleum, cork, tiles, etc., to concrete and other floors; sticking wallboard and insulation board to various wall surfaces; sticking asbestos sheeting, rubber, etc., to tables, bar counters, etc.

294, Bostik cement, somewhat similar to 292C, but used especially for sticking rubber, etc., to metal surfaces.

15, Bostik cement, a Latex-type adhesive specially designed for application by spray for upholstery work.

161, Bostik cement, a very powerful rubber adhesive, specially designed for upholstery work.

E. P. Barrus Ltd. (Stand 17), 36, Upper Thames Street, London, E.C.4, have a wide range of maintenance equipment and tools displayed on their stand. In a prominent position at the back is a Johnson display board, complete with a low-voltage generating plant. Other equipment includes a new portable Aro aircraft lubricator unit, Bennett petrol pumps, a Holmes metal (solder) spraying unit for filling out indentations and samples of K.W. cylinder graphite lubricant.

There is a range of Mariol Powerlite lanterns which provide a strong focused beam as well as a secondary diffused light. There is also a Unity spotlight displayed on the stand.

An example of the Northill folding anchor is shown. This type of anchor has been specially designed for craft where weight is of importance.

AIRPORTS EXHIBITION (CONTINUED)

Other features of the display on Stand 17 include Blackhawk socket wrenches, Cleveland drills, Driver drill presses, various Porter shear jaw cutters, Starrett wrenches and Stanley products.

B.E.N. Patents, Ltd. (Stand 8), 35-37, Upper Thames Street, London, E.C.4.—The exhibits on this stand are representative of the company's well-known range of machines and equipment for the efficient spraying of aeroplane dopes, synthetic enamels, lacquers, etc.

Of special interest is the B.E.N. "Pneu-Spray," a portable spraying machine designed to operate one B.E.N. type DC or G spray gun continuously. Compressor, receiver and motor are mounted on a substantial steel base fitted with rubber-tyred caster-steering wheels. Regulation of spraying pressure to suit the density of the material is by means of a special unloader, which also allows the machine to run idle when the gun is not in use.

Another exhibit is the new B.E.N. "Varispray," a high-speed production gun capable of handling all classes of spraying materials, giving, it is claimed, perfect atomisation with maximum speed of coverage.

It incorporates a simple control whereby the operator can vary the width of the spray and change it from fan to round form without interrupting the spraying operation. The "Varispray" gun is well balanced and comfortable to handle.

Boulton and Paul, Ltd. (Stand 22), Norwich.—This exhibit will be on similar lines to that staged at the last Airports Exhibition, and will consist of a series of photographs illustrating buildings and equipment which the firm has supplied for aerodromes during recent years.

Joseph Bradbury and Sons, Ltd. (Stand 34), Braintree, are showing some items of specialised aircraft and aerodrome service equipment typical of the range they manufacture to manufacturers' own designs and specifications. These will include:—

(1) The G.E. patented aircraft lamp, made from high-grade materials and with an effective height range of from 2ft. to 17ft. 6in. from the ground. The reflector is adjustable for any position and at any angle.

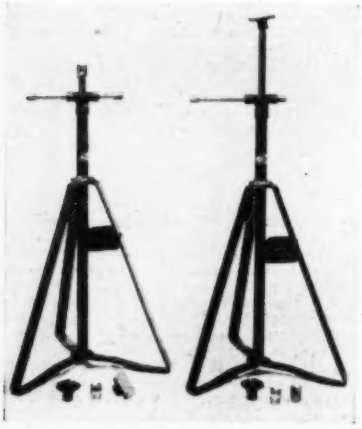
(2) A portable bench for use on the aerodrome, to take a range of small tools, for adjustment and repairs to aircraft.

(3) An engine stand typical of the wide range of such equipment manufactured for this purpose.

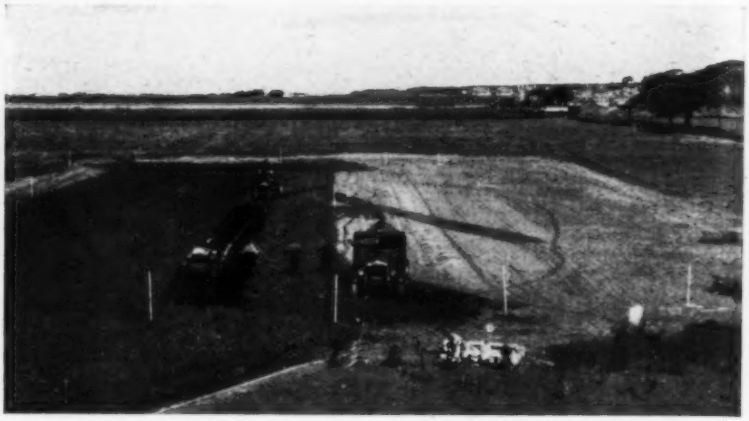
British Bitumen Emulsions, Ltd. (Stand 2), Trading Estate, Slough, are specialists in the stabilisation of soil for the construction of aerodrome runways, car parks, etc. Demonstrations are made showing the strength and hygroscopic properties of soil in an unstabilised state compared with that which has been stabilised with "Lomix." Actual samples of stabilised soil from work that has been carried out are also on view. A display of photographs shows soil stabilisation operations at different stages.

In addition, various samples of "Bituproof" products for waterproofing work are shown—there is a model air-raid shelter which has been waterproofed and insulated with the company's products.

Samples demonstrating the use of "Elisol" for protection against condensation and for thermal and sound insulation are also on view.



Aircraft jacks by Brown Brothers, Ltd. (Stand 26.)



Treatment of Prestwick Aerodrome (Scottish Aviation, Ltd.) by "Lomix" soil stabiliser, which has been applied by pressure from a distributor on the back of the tractor seen in the photograph. In the background is a grader mixing the soil after treatment. (British Bitumen Emulsions, Ltd.—Stand 2.)

The British Thomson-Houston Co., Ltd. (Stand 16), Crown House, Aldwych, London, W.C.2.—The exhibits on the stand of the British Thomson-Houston Company comprise a representative range of Mazda and Mercra lamps, together with B.T.H. lighting equipment.

There is a range of 6- and 12-volt Mazda lamps in various wattages ranging from 2.4 to 36, for the lighting of cabins, instrument boards, etc.

A special group of low-voltage, high-wattage lamps has been developed for use in landing lights. All Mazda aircraft lamps comply with Air Ministry regulations.

There is an extensive range of Mazda projector lamps available, and particular attention is directed to line filament lamps, which, owing to the form of the filament, are eminently suitable for certain types of equipment.

Mercra lamps, by reason of their extraordinary high efficiency, are particularly suitable for the economical lighting of large interiors, such as hangars and aeroplane workshops. They are made in four wattages —400, 250, 125 and 80 watts, and in the usual supply voltages of 100/130 and 200/260. They can, of course, only be used on alternating current and in combination with chokes.

The 80-, 125- and 400-watt Mercra lamps (200/260 volts) can also be supplied with fluorescent bulbs. These are suitable for the lighting of workshops and other interiors where good colour rendering is important.

There is a wide range of B.T.H. equipment available, and the new B.T.H. Mazdalux "Ten" projector for "apron" lighting is perhaps the most interesting. This projector has been specially designed for this type of lighting and its optical system is claimed to be such that all glare is obviated. High-quality reflectors for the interior lighting of hangars and workshops are also shown, together with other small fittings for localised lighting.

British Unit Heater and Radiator Co. (Stand 47), 3, Victoria Street, London, S.W.1.—This company is exhibiting a range of "Copperad" unit heaters, which products are very extensively used for the heating of aerodromes and similar buildings. They are particularly adaptable for this purpose, since the heaters are placed at high level, mounted on the roof trusses, and warm air is blown downwards, so providing a very rapid warming up of the building.

"Copperad" unit heaters are manufactured for operation on steam, hot water or electricity, and they are offered in a very wide range of sizes, having outputs from 20,000 to 300,000 B.T.U.s per hour, according to requirements.

The unit heaters can be fitted with Buxton-tested flame-proof motors for dope shops and similar buildings.

Brown Brothers, Ltd. (Stand 26), Browns Buildings, Great Eastern Street, London, E.C.2, are specialists in modern equipment for the speedy execution of aerodrome and workshop services. At each of their twenty-six distribution centres throughout the country technical experts are immediately available for maintenance service and to offer advice in the selection of new or the replacement of obsolete gear.

A catalogue lists a large range of workshop equipment always held ready for immediate delivery. Amongst the items to be found in the list, and of which a representative range is exhibited on this stand, will be found the following: "Aerojacks" (aircraft adjustable stands), air compressors, battery maintenance equipment, benches and bench legs, B. and D. workshop, clothing, degreasing plant, drills and drill stands, electric polisher, electric and pneumatic drills, gauges, heat gun (for starting, drying and

Chance Bros. flush-fitting runway marker light. (Stand 5.)

AIRPORTS EXHIBITION (CONTINUED)

defrosting), jacks of all types, lubricating equipment, oil trays, paint- and dope-spraying equipment, pedestal lights and inspection lamps, pinking shears, respirators, small tools, storage bins and racks, tool chests, valve maintenance equipment, vices, welding outfits.

Adjustable and adaptable, the Rothswan patent "Aerojacks" supersede clumsy wood trestles and other makeshift devices. The rigid tripod base stands firm on uneven ground and gives a surface contact of 40 sq. in.—a valuable feature when in use on soft ground. Two models, each with a set of interchangeable saddles, are available, with ranges of 23-38in. and 36-54in. respectively.

Brown Brothers also have a lighting service department which will gladly provide for and advise on the subject of lighting equipment for aerodromes, hangars, workshops, airport buildings, waiting rooms, offices, etc.

Butlers, Ltd. (Stand 32), Atlantic Works, Grange Road, Small Heath, Birmingham.—This firm, which specialises in aircraft and automobile lighting equipment, as well as in presswork, is featuring its aerodrome lighting equipment, which includes large and small searchlights and signalling apparatus.

Callender's Cable and Construction Co., Ltd. (Stand 25), Hamilton House, Victoria Embankment, London, E.C.4, show a model of the Callender-Hamilton unit-construction hangar (described in *Flight* a year ago), which has a steel framework consisting of a series of box-girder ribs comprising vertical stanchions supporting flat-pitch roof girders. It has sliding doors at each end. All parts are standardised, and the hangar can be erected at a low capital expenditure, with negligible maintenance costs afterwards. This type has been supplied to the Air Ministry for erection at various aerodromes.

Also exhibited are (1) various types of electric cables, rubber-insulated, flexible tough-rubber sheathed, low-tension and super-tension paper insulated, single-conductor welding, with plain or hard-cord braided finish; (2) Kalbitum paint, a bitumenised product which is weather- and corrosion-resisting; (3) Kalanoid compound, which remains plastic, yet is waterproof and is used for other purposes as well as its original one of filling junction boxes in wiring system work; (4) specially made adhesive tape (for making and protecting joints in rubber-insulated cables).

There is also an enlarged aerial view of Sywell Aerodrome. Callender's have a complete organisation for carrying out electrical installations of all types, with branches throughout the country.

Cardiff Foundry and Engineering Co., Ltd. (Stand 36), Hurman Street, Cardiff.—No detailed information regarding this exhibit is available, but the firm has been known for some years in connection with the "Pillar of Fire" boundary beacon, as installed at Doncaster and Cardiff airports.

An illuminated, orange-lighted pillar is held upright by three stays. In the event of an aircraft accidentally striking the pillar, the stay breaks and the pillar collapses away from the aircraft, at the same time breaking the circuit and thus preventing all danger of fire.

Cellon, Ltd. (Stand 27), Cellon Works, Kingston-on-Thames, Surrey.—This exhibit will be representative of the Cellon specialities, which include:—

Cellon aircraft finishes.—All grades of aircraft finishes to the requisite Air Ministry specifications, including Cellon dopes, "Cerrux" synthetic finishes, "Cerric" cellulose finishes and "Cerrex" chromated primers, Cellon dope-proof tape and all sundries for the finishing shop.

Cellon patented strip-sealing process.—This process covers an improved method of sealing lines of rivets, edges of lapped or butted panels, petrol tanks, etc., of all-metal construction, which have caused difficulty in treatment in the past. The thermoplastic and chromated adhesive employed has been further improved, and is completely unaffected after continued immersion in seawater, oil, petrol, etc. Research has now perfected a small electric iron which may be employed in conjunction with this process.

"Cerrux" modern decorative finishes.—A complete range of synthetic painting materials for all protective and decorative work, as used on many large aircraft factories and airports.

The "Cerrux" film, it is claimed, possesses a unique combination of properties, including tenacious adhesion, flexibility, hardness and stability, with freedom from decomposition, and is therefore particularly valuable for external protection and interior decoration. The display at the Exhibition includes representative specimens of the various "Cerrux" finishes.

Decorative spraying.—"Cerrux" flat, satin and gloss finishes provide a ground surface particularly suitable for decorative spraying, several interesting specimens of stencil spraying being shown on the stand.

"Cerrux" de-oxidising primer.—Of particular interest for steelwork structures and corroded metal surfaces, this material is a de-oxidising agent for converting to an inert compound by chemical reaction all "live" rust particles remaining buried after wire brushing.

Also shown are "Cerreen" semi-synthetic gloss finish, a new Cellon production shortly to be placed on the market, and "Cerrusco" water paint and plastic paint.

Chance Bros and Co., Ltd. (Stand 5), Lighthouse Works, Smethwick, Birmingham.—The exhibits on the stand of this well-known firm of lighting specialists include:—

Fixed-type floodlight for surface illumination.—This comprises six 1 kW. para-trough reflector units in non-metallic housing and gives a beam candle power of 1,000,000. Advantages include safeguard against total failure due to single-lamp breakdown, and there is a simply operated focusing device.

Runway marker or contact lights.—These have been designed to give maximum light at low angles (8 deg. to 3 deg. above horizontal through 360 deg. in azimuth). The dome glasses are tested to carry a static load of 15 tons/sq. ft., and have carried 45 tons. Lamps of this type are used in the Ringway Airport system described in last week's *Flight*.

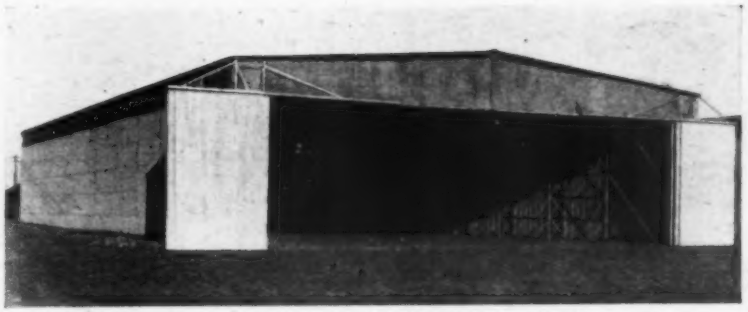
Boundary lights—illuminated skirt type.—These are easily collapsed by an 80-lb. load applied horizontally at the top of the fitting; the electrical contacts are then automatically broken and sealed. Low-voltage (6.6 v.) lamps are used.

Airway beacons.—One and a half-kilowatt revolving type, with 24in. mirror and automatic lamp changer; 1,800,000 beam candle-power.

Landing direction indicators, direct wind operated and auxiliary wind vane operated. The latter type is sensitive to winds of 1½ m.p.h. and does not oscillate in gusts.

Automatic electric standby plant, to take over lighting services in the event of mains failure; embodies many "Austinlite" features.

Also represented are obstruction lights, mobile floodlights, ceiling lights, signalling lamps, etc.



The Callender-Hamilton unit-construction hangar, showing wide, unobstructed door opening. (Stand 25.)

Desoutter Brothers, Ltd. (Stand 7), The Hyde, Hendon, London, N.W.9, are demonstrating their range of portable pneumatic and electric tools. These include the famous "Mighty Atom" range of ⅜in. drills, including the close corner drills specially designed for the aircraft industry, together with shears, screwdrivers and nut runners, which are used in large quantities throughout the industry.

They are also demonstrating the Desoutter portable pneumatic nibbler, which was originally designed for Service work on metal-skinned aircraft, and is now coming into great demand in many factories for such jobs as cutting out portholes in finished and assembled fuselages, cutting out inspection panels in wings and similar jobs, which, by any other method, would take much tedious drilling and filing.

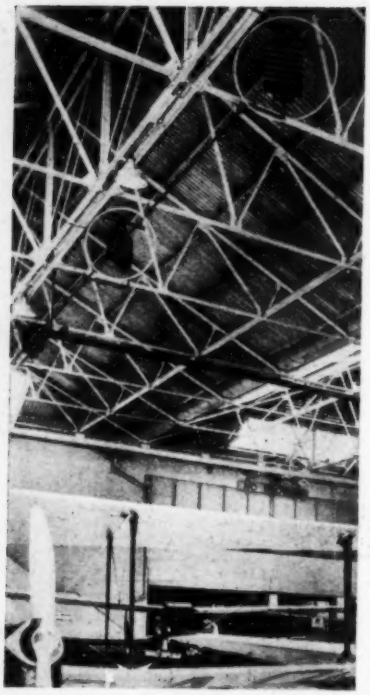
The family of larger rotor-type drills running up to ¾in. capacity are also on view, together with the Desoutter electric drill guns, ranging from the type A1 ⅜in. capacity, 5,000 r.p.m. model, specially designed for rapid production in duralumin, to the type B3—⅝in., 450 r.p.m. drill gun, designed for working in high-tensile or stainless steels and other such tough materials.

Fully qualified sales engineers are in attendance to demonstrate the tools and to answer any technical queries. The tools shown, it is stated, will be willingly supplied on loan to any interested parties without any obligation on their part.

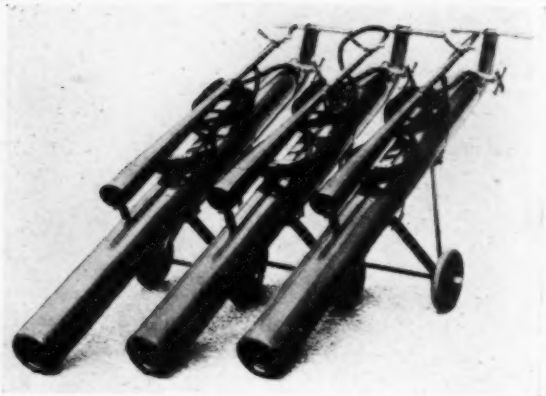
Epco, Ltd. (Stand 12), Star Works, Leeds, 7, are showing their "Epco" hydraulic trolley jacks, portable floor cranes, degreasing plant and trestles and stands.

Esavian Doors (Stand 18), Esavian House,

The Desoutter "Mighty Atom" countersinking tool. An adjustable stop on the nose of the tool limits the depth of countersink, and by removing the risk of the operator going too deep greatly speeds up the operation. (Stand 7.)



(Left) "Copperad" unit heaters installed in the roof trusses of the Airwork hangar at Heston. (British Unit Heater Co.—Stand 47).



(Right) One of the many sizes of "Lux" carbon-dioxide fire extinguishing units made by the Walter Kidde Co., Ltd. (Stand 43).

181, High Holborn, London, W.C.1.—On this stand is a working model of a hangar showing Esavian folding and sliding doors opened and closed by electricity, together with photographs of various aerodrome hangars fitted with these doors.

There are also sample fittings showing the strength and simplicity of the movement and why there is no need to add extra strength to the lintel, as the whole weight of the doors is carried on the ground. Also shown are details of the motor that provides the power for opening and closing the doors.

The makers are showing a short film illustrating the doors in actual operation, and it is hoped during the period of the Exhibition to exhibit a film showing the manufacture of the doors and their actual working at a number of aerodromes and aeroplane factories where they have been fitted.

FLIGHT

A display of aerial and other photographs by the Photographic Staff of this journal will be a feature of

STAND 37

(Flight Publishing Co., Ltd.)

General Aircraft, Ltd. (Stand 45), Feltham, Middlesex.—This stand is devoted entirely to a display of the G.A.L. smoke wind indicator.

An actual working model produces smoke under glass, the whole system being hermetically sealed and the air being "cleaned" automatically. Switches control the apparatus, as in everyday use.

A complete apparatus is cleaned up for examination of detail.

A model aerodrome demonstrates night illumination of the smoke and the beacon incorporated in the system. The model is arranged to be in near-darkness and a flash system operates miniature lights round the land circle.

A "mushroom," with lighting apparatus below, is a full-size example of one of the 15 placed round the circle, so designed that it directs light without causing any obstruction to aircraft.

Kurt Erlach, Ltd. (Stand 20), Volspray Works, Cray Road, Sidcup, Kent.—A comprehensive range of the well-known "Volspray" painting equipment, air-compressor sets and allied equipment is exhibited. As there are already (it is claimed) something like 500 complete "Volspray" painting outfits of one type or another supplied to the aircraft industry in Great Britain, the manufacturers of this equipment are fully qualified to give the technical assistance and advice to visitors. The firm are contractors to the Air Ministry.

Amongst the exhibits are the "Volspray" 1A/3. This is a small portable electrical unit which operates off the ordinary electric light point. It has a one-third h.p. motor and works a standard full-sized spraying gun. It is claimed that any paint of standard spraying consistency can be speedily and perfectly applied and, by reason of a patented system of spraying known as the "Air Volume" method, with considerably less paint fog and fumes than is usually associated with such high-speed spray-painting machines. The price is extremely low for such an efficient tool.

Larger petrol and electrically operated spraying plants are on view, including the "Volspray" Fourteen portable petrol-driven compressor set.

A speciality on view for the first time and of particular interest in these uncertain times will be the "Volspray" camouflage sand-spraying set. This has been specially designed for the speedy and even distribution of camouflage sand on to prepared surfaces. In addition, there is the "Plastaspray" pistol for spraying stone or sand paints, also widely used for camouflaging.

General Electric Co., Ltd. (Stand 44), Magnet House, Kingsway, London, W.C.2.—The main exhibit is the floodlight portion of a mobile floodlight. The complete equipment, with its petrol engine, alternator, exciter, and switchgear, all mounted upon a trailer, is shown in one of a series of photographic illustrations on the stand.

The floodlight consists of two parabolic silvered glass trough reflectors, each accommodating a 2,000-watt Osram horizon-type lamp. Sheet copper and non-ferrous metals have been used throughout except for the two-piece cast-iron rotating base. The whole floodlight is surmounted by a two-lamp obstruction light fed from the low-voltage equipment on the trailer.

Diagrams of contact lighting systems will be shown. G.E.C. contact lights are designed for positioning direct into the ground or alternatively in a concrete pit, and a large cast skirt ring is provided round the head of the fitting for additional stability; it also prevents grass growing inwards and obscuring the light.

An installation of contact lights is frequently assisted by an installation of approach lights using either Osira mercury vapour lamps or Osira sodium lamps. Mercury vapour lighting has several applications in the aeronautical sphere and is demonstrated in dispersive reflectors suitable for the lighting of hangars or aircraft factories.

Within the limited space available on the stand G.E.C. illustrate many items from its range of aerodrome lighting equipment, which, in addition to those exhibited, include fixed floodlights of the open and shadow bar types as well as in housings, boundary lights, obstruction lights, wind tees, wind velocity indicators, route beacons and neon identification beacons—all of which have been installed in leading aerodromes in Great Britain and abroad. There is also a range of small Osram aircraft lamps.

General Fire Appliance Co., Ltd. (Stand 11), 11, Queen Victoria Street, London, E.C.4.—This exhibit shows some typical examples of the equipment for fire protection and fire fighting at aerodromes and aircraft factories. Among the company's products are a fire tender (Mark II) designed for the protection of airports and aerodromes. Equipment consists of one to three 30-gallon Bromylene "Fire-Froth" extinguishers, a type chosen by the Air Ministry for use on all Royal Air Force aerodromes. The spreader, attached to the 30-gallon Bromylene extinguisher, pours a cascade of foam impregnated with a fire-extinguishing gas upon the fire. The spate of foam falls in the form of a large cone. The gas has no toxic effects and immediately quenches the fire, and the foam forms a blanket, thus preventing reignition. Eight 2-gallon "Fire-Froth" extinguishers, two C.T.C. "Vixen" extinguishers, together with axes, crowbars, bolt-creppers, asbestos gloves, etc., make up the supplementary equipment.

It is claimed that the fire-quenching properties of Bromylene (used in General Fire Appliance equipment) are far greater than those of any other mixture hitherto known. Used either in conjunction with water or foam it increases very considerably the efficiency of both.

Another useful appliance which has been specially designed for use in crash fires, for pulling away parts of burning fuselage to enable rescue work to be proceeded with, is a hook of case-hardened steel fixed to a 12ft. steel tube, attached to which is a cable with handlebars. The appliance has a patented folding device, by means of which its length can be halved to enable it to be stowed on a fire engine.

Halder Construction, Ltd (Stand 56), Kingsbury House, 15-17, King Street, St. James's, London, S.W.1.—On this stand will be found a section model of the "Satujo" system of drainage which has been extensively adopted by the French authorities for aerodromes in France and has recently been introduced into this country by Halder Construction, Ltd.

In this system a jointless continuous pipe takes the place of the ordinary disjointed earthenware pipe. By a special process the pipe is cast in the trench, the top half of the pipe being formed of large-sized aggregate, the lower half of impervious concrete. All danger of silting, it is claimed, is avoided. Forty-eight per cent. of the area of the pipe is absorbent and draws moisture from the surrounding soil by capillary attraction, assisted by partial vacuum. On level areas only a very slight declivity ensures rapid flow and removal of water.

Owing to the effectiveness of the system, the cost of which is approximately the same as that of any other permanent method, the pipes can be laid farther apart.

It is stated that particulars of tests are

AIRPORTS EXHIBITION (CONTINUED)

available showing that the resistance of Satujo pipes to shocks from traffic is many times greater than that of earthenware pipes, an important factor where the landing of heavy aeroplanes is involved.

John Hall and Sons (Bristol and London), Ltd. (Stand 4), Broadmead, Bristol, 1, and 1-5, St. Pancras Way, London, N.W.1.—Besides showing an example of standard primrose airport paint, a range of Brolac panels illustrates the finish which is obtained by the firm's speciality in hard-gloss paints. The protection obtained by the use of Brolac, together with its high finish, make a strong appeal where quality, durability and finish are considered of importance.

Where temporary structures have to be protected, or in cases where it is desirable that the initial cost of painting should be kept down, "Bristol" brand paint is advised; it is available at a very competitive price.

Murac, the new finish for interior walls, is also shown. Though a true paint, it also has the advantage that it can be applied with a distemper brush, thereby bringing the cost of application down to that of a water paint.

Besides these old and well-tried lines, the company is showing examples of camouflage paints in approved shades. These flat finishes have been specially formulated for easy application, good covering power and durability, coupled with low initial cost.

W. T. Henley's Telegraph Works Co., Ltd. (Stand 46), Holborn Viaduct, London, E.C.1.—These exhibitors stage a representative display of their comprehensive range of electric cables, wires, flexible cords, electrical distribution equipment and allied apparatus. Among the wires and cables exhibited are specimens with insulations of cotton, silk, enamel, rubber, bitumen, paper, varnished cambric, etc., and all types of aerial conductors.

A particularly interesting item is a coaxial low-capacity cable for D/F. apparatus. At intervals along the copper conductor, discs are threaded and are kept at a predetermined distance apart by paper tubes slid on to the conductor. Overall is a lead tube which fits the periphery of the discs. Other exhibits include:—

Unit-type overground disconnecting boxes and panels; underground disconnecting boxes; straight-through, service and branch boxes featuring the Henley "Cablegrip" type boxes; lead sleeves, pressed-lead service boxes and branch boxes with c.i. protection shells, all of which are suitable for l.t. cable jointing; h.t. straight-through boxes, suitable for voltages from 3,300 to 11,000; and cable sockets, claw connectors, bonding clamps, grip-type jointing sleeves, joint box compounds and jointing accessories.

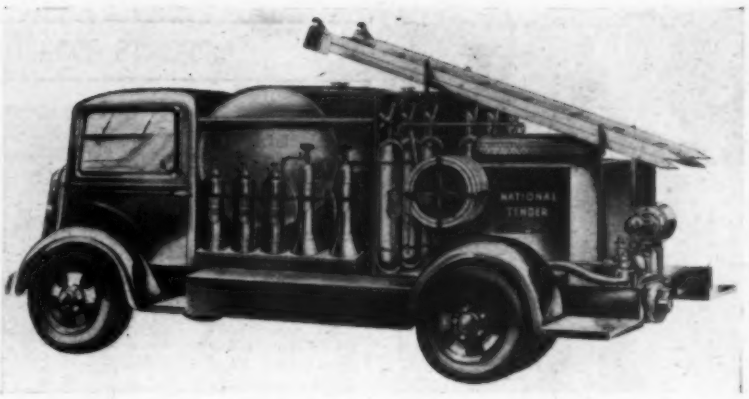
Also shown are Isco (Series 3) insulated service fuses; Isco Ironclad service fuses; and Henley Sharborn relays, applications of which cover a wide field (being an electrically operated quick make-and-break switch, the relay is suitable for remote control by push-button, time switch or thermostatic control); a working exhibit is on view.

The Solon industrial type electric soldering iron is also shown. This useful tool is obtainable in three sizes—65 watt, 125 watt or 240 watt.

Lastly, there is a new cold filling compound for use with paper-insulated cables. It is sufficiently fluid to fill the interstices in a joint and sets in a reasonably short time to a stable solid, with suitable physical, mechanical and electrical characteristics.

Hydran Products, Ltd. (Stand 6), Hydra Works, Gresham Road, Staines, Middlesex.—On this stand are the firm's "Hydra" oil burners, which should prove of interest to all aerodrome operators with heat plant or similar services to maintain. They provide heat for boilers, using a fuel which is easily and cheaply obtainable—waste oil. The oil is pumped through the hollow spindle of a small electric motor and emerges in a fine, whirling film from a conical orifice. A fan, concentric to the spindle and revolving in the opposite direction, thoroughly atomises the oil and mixes it with air before ignition.

The burner is made in two sizes, 5 gall./hr. max. (750,000 B.Th.U./hr. max. load) and 10 gall./hr max. (1,500,000 B.Th.U./hr. max. load).



The standard airport tender supplied by National Fire Protection, Ltd. An alternative version has a six-wheeler chassis. (Stand 19.)

The Walter Kidde Co., Ltd. (Stand 43), Lux Works, Belvue Road, Northolt, Middlesex, have specialised in utilising carbon dioxide gas for fire protection, aircraft flotation gear, etc. The Royal Air Force and the U.S. Air Service have, it is stated, adopted "Lux" equipment for fighting crash fires.

Carbon dioxide, stored in cylinders and discharged through quick-opening valves to a specially designed discharge horn, has proved itself most valuable for permitting the rescue of personnel from a burning aircraft. CO_2 smothers the fire and enables the rescuers to get close in almost immediately.

The equipment may be obtained in all sizes from a small cylinder containing 2 lb. of liquid CO_2 to batteries of cylinders such as are used on Air Ministry tenders containing 360 lb.

It has the added advantage that it does not deteriorate or freeze up, even in the coldest weather, does not require annual recharging and does no damage to any material.

The Walter Kidde Co., Ltd., are in a position to supply all necessary equipment in accordance with the latest Air Ministry civil regulations. They have already supplied many tenders to private aerodromes in this country.

Ernest Lake, Ltd. (Stand 23), Bishop's Stortford, are showing representative examples from their range of aircraft servicing equipment. This includes engine stands, Air Ministry pattern, for a number of well-known units, including the Gipsy Six and Gipsy Major; jacking trestles, including fuselage and tail types; side-tracking skates for moving aircraft sideways or in any direction and "Colosyl XTL" non-poisonous degreasant. Special equipment can also be designed or built to order.

London and Midland Steel Scaffolding Co., Ltd. (Stand 31), Iddesleigh House, Caxton Street, London, S.W.1.—This exhibit consists mainly of Burton's patent "Quick-Grip" tubular-steel scaffolding fittings, aptly described as "an engineer's Meccano set."

Certainly the variety of erections which can be made with this equipment rivals that of the famous toy. Already largely used in the aircraft construction industry, the scaffolding should be equally useful in and around aerodrome buildings, not only for building-repair work, but for aircraft erection and maintenance, for making mobile trestles, jig tables, storage racks, etc.

As compared with wooden equipment, it is claimed, greater strength is available, depreciation is infinitesimal and there is no fire risk.

Marconi's Wireless Telegraph Co., Ltd. (Stand 14), Electra House, Victoria Embankment, London, W.C.2.—The Marconi Company can claim the unique distinction of being the first wireless company in the world. Established in 1897, at the very birth of wireless communication, the knowledge which has been accumulated in 42 years' experience is of infinite value in the application of wireless to commercial needs.

At the Airports Exhibition the apparatus shown by the Company is the "Marconi-track" ultra-short wave approach beacon equipment. This includes the instruments to be installed both in the aircraft and on the aerodrome.

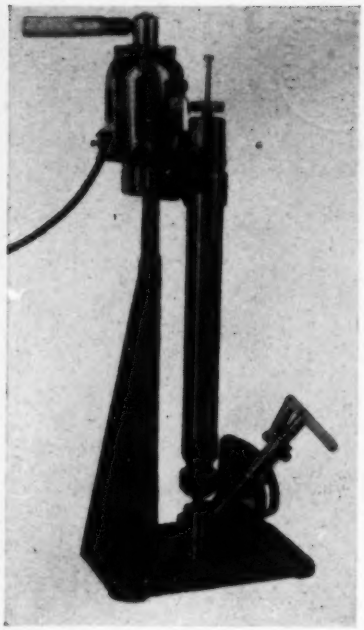
The Type AD66 receiver for installation in the aircraft has been designed to operate in conjunction with any ultra-short wave approach beacon which conforms with international requirements regulating such beacons. Careful attention has been paid to securing a minimum of controls and to subdividing the equipment into units—while retaining lightness of weight and rigid construction—thereby facilitating installation in any aircraft. A change can be made from one to another of six different frequencies simply by the turn of a switch.

The aerodrome installation comprises a main beacon transmitter, two marker beacon transmitters, and the necessary control and monitoring equipment. Not the least of its advantages is the special method of directional transmission whereby the range performance of the earlier types is maintained with a fraction of the power; first cost and upkeep are therefore considerably reduced.

E. Mopin and Co., Ltd. (Stand 21), 25, King Street Chambers, 1, King Street, Leeds, 1.—This firm is marketing the patent hangar designs of a French inventor, M. Mopin. The hangars are circular, made of steel, and in diameters from 100 to 330ft. It is claimed that the "utilisation coefficient" of the Mopin hangar is considerably higher than that of orthodox rectangular types.

Morris and Ingram (Stand 29), 26, Finsbury Square, London, E.C.2.—Aerodrome workshop equipment, with special emphasis on engine overhaul plant, is being shown by this firm. Four exhibits are Hall machines described as model A aero-angle type eccentric valve seat grinder; model EJA-10 aviation type eccentric valve seat grinder; model H cylinder hone; and piston-pin hole hones. "Sioux" machines are a model 662 wet-type valve refacer; model 2070 6in. bench grinder; and sanders and polishers.

Mosers, Ltd. (Stand 15), 170-192, Borough High Street, London, S.E.1.—This firm, which, it is stated, has supplied the engineering industry and kindred trades for 150 years, is exhibiting a comprehensive range of small tools, precision tools and general engineering equipment. The small tools embrace the "Two Dogs" brand drilling and screwing tackle, manufactured by Easterbrook Allcard and Co., Ltd.; Moore and Wright precision tools—micrometers, verniers, etc.; Rabone rules and measuring tapes; "Eclipse" magnetic chucks, "Record" and Parkinson vices. A full range of electric tools is also



displayed, including drills, grinders, sanders, torsimeters, shears, hammers and saws by "Wolf," Black and Decker, Grimston, "Skilshaw" and "Coll-Ace."

The A.I.D.-approved aircraft department of the firm is represented by a display of A.G.S. parts and a selection of approved electrical equipment, manufactured by Lissen, Ltd., for whom Mosers are sole distributors.

In addition, a special feature is made of A.R.P. appliances.

National Fire Protection Co., Ltd. (Stand 19), Petersham Road, Richmond, Surrey, are showing a range of aerodrome equipment including, in addition to the well-known "Essex" methyl-bromide types, "Richmond" soda-acid and foam extinguishers and "Sheen" carbon-tetrachloride pump-type extinguishers.

Of particular interest in the "Essex" range is the aircraft installation type to deal automatically with fires either originating in an engine or as the result of a crash.

For aerodrome fire protection there is a very powerful truck unit capable of extinguishing the largest petrol and oil fires, and consisting of three of the largest "Essex" methyl-bromide cylinders interconnected on one truck. There are, in addition, smaller sizes to meet all requirements. In the large cylinders means are provided to shut off the flow of methyl bromide as soon as the need is over.

It is stated that, while the quickest way of extinguishing a petrol fire is by the use of methyl-bromide, in some circumstances, where speed is of less importance, it may be preferable to use foam. The "Richmond" foam range of extinguishers extends from the one-gallon size to the 50-gallon size.

The new "National" mechanical air-foam hand-pump is shown. It includes a three-gallon container from which either water or foam may be produced at will.

An important range of special aerodrome tenders has been designed and is available, but owing to limited accommodation none is on view.

Newton Brothers (Stand 3), Pontefract Road, Cudworth.—"Newton" products on this stand comprise the following:—

Universal boring bar, for boring main bearings in line—and *in situ*. Heavy cast-iron jigs support a line boring bar which is ground to fine limits. New or remetalled main bearings are bored, faced, and radius-turned by cutters set to size by micrometer.

Self-calibrating vee micrometer, designed especially for the rapid and accurate setting of cutters in round boring bars, and for testing degrees of error on crankshafts, etc.

Universal con.-rod boring jig, a specially designed cast-iron jig for accommodating all sizes of con.-rods and supplied together with boring bar and cutters for the rapid and accurate finishing of big-end bearings.

Masterpiece con.-rod aligner, supplied mounted on a cast-iron pedestal of convenient working height. Accessories include three new-type expanding mandrels, one bending tool and one set of twisting irons. Readings of errors are taken on two dial indicators, also part of the equipment. Rectification is carried out with the work *in situ*.

Variable-feed unit, now offered as an alternative to the standard type of feed. No servicing is required, and feed can be varied from 6 T.P.I. to 600 T.P.I., giving coarse feed for "roughing" and superfine feed for finishing. It can be supplied for either main bearing boring or connecting-rod boring jigs.

Lastly, there is a new type of stud extractor which provides a grip at the face of the cylinder block, thus making it possible to remove even short broken studs.

John B. Pillin (Stand 51), Church Hill, Beckenham, Kent.—No detailed information on this exhibit is available, but the firm specialises in aerodrome equipment, including a low-pressure oil pump for obviating compressed air in storage tanks; portable oiling units; oil and grease guns and sprays; air compressors, fixed and portable; air receivers, oil-storage tanks, with and without meters; dispensing towers; blow guns.

The Plessey Co., Ltd. (Stand 42), Vicarage Lane, Ilford, Essex.—A complete short-range radio installation for use at airports forms the principal exhibit. The transmitter operates over the 900-metre band of frequencies on C.W. with an output of 80 watts, or radio telephony with an output of 40 watts (carrier). The transmitter is fed by A.C. mains, and contains no batteries of any sort, or motor generators. It is remotely controlled from a point which may be several miles away, over two wires only. In some cases these transmitters have been operated over Post Office lines.

The operator at the remote point can switch the transmitter on and off, leave the filaments on to keep it warm, or change instantly from R.T. to C.W.

The speech and keying are conveyed over the same two remote control lines, and, in addition, a revertive check is incorporated so that the operator can see the condition of the transmitter at any moment, even while he is keying or speaking.

The receiver operates from a screened crossed loop aerial, and is provided with a 12in. goniometer incorporating a special circuit whereby sense is given on the same pointer as direction. An adjustable QDM scale is fitted.

Volume limitors are incorporated for both C.W. and telephony and may be adjusted to a level to suit the operator, so that he may listen through his own signals.

A short-wave communication transmitter is also exhibited. This covers the range from 1.5 to 7.5 m/cs. and is shown in action with part of the actual tubular steel masts for supporting a dipole aerial.

The transmitter is controlled from a remote point over two wires in exactly the same manner as in the case of the short-range transmitter, except that telephony is not provided. By a very simple modification, however, telephony can be operated over the same two control wires.

Lastly, a chart of the British Isles is shown. This chart is mounted on a substantial wooden baseboard with metal frame, and is intended for direction finding. The graticule is calculated on the basis of the gnomonic projection centred at 53 deg. north latitude and 2 deg. west longtitude.

Short and Mason, Ltd. (Stand 41), Aneroid Works, Macdonald Road, London, E.17.—The exhibits on this stand consist of the following "S. and M." products:—

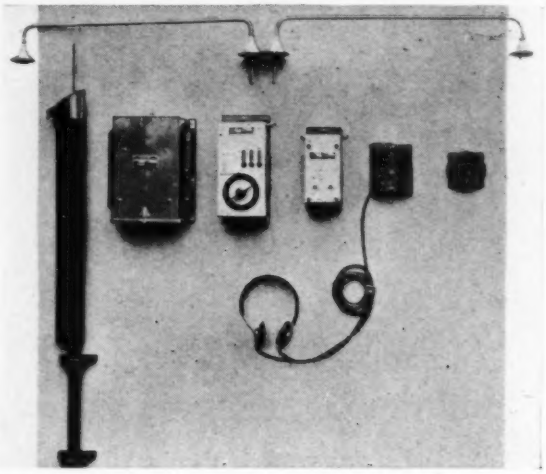
Micro-barograph, large size British M.O. pattern. This instrument has a high degree of sensitivity. It is furnished with a very open scale and compensated for temperature. There is also a smaller model, embracing the above features.

Bi-metallic thermograph, British M.O. pattern, with high-drum clock and chart, giving very open readings and extreme sensitivity.

AIRPORTS EXHIBITION (CONTINUED)

(Left) The Hall model EJA 10 aviation-type eccentric valve seat grinder. (Morris and Ingram, Ltd.—Stand 29.)

(Right) The aircraft equipment in the new Marconi blind approach system. Although six frequences are provided the size is small and the weight low; the cockpit unit (seen with headphones) measures only 5in. by 4½in. (Stand 14.)



Short and Mason remote-reading anemometer. (Stand 41.)

Hygrograph (recording hygrometer), recording on a chart the actual percentage of humidity contained in the atmosphere.

Wind-velocity indicator (remote-reading anemometer).—The apparatus consists essentially of two main components, the wind-head generator and the indicator. The rotation of the cups on the anemometer operates a small generator, power from which is transmitted to the indicator, which is of the long-scale moving-coil type, calibrated in miles or kilometres per hour. A line of up to 150ft can be used without impairing accuracy.

Wind direction indicator.—The apparatus consists essentially of two main components, the transmitter or head and the receiver or indicator, connected through the medium of a 16-core cable of any length. The instrument works on a current of 6 volts, supplied from a small transformer and rectifier, but it can be operated from an accumulator equally well. The operating EMF is exceedingly low. The instrument is supplied with a 6in. dial for mounting on a wall.

Other "S. and M." apparatus shown includes an electrical cup anemometer, recording rain gauges, Cunningham frost predictor, mercurial barometers, meteorological thermometers and various other instruments.

Silent Gliding Doors, Ltd. (Stand 50), 38, Ingate Place, London, S.W.8.—Here will be found a small-scale working model of the "Aerodoor," a hangar or works door operating on the special system evolved by the firm.

It may be roughly described as consisting of a number of narrow upright metal leaves (actually, "cold-rolled steel hollow mullions") hinged together side by side to form a door of any required size. Running at top and bottom on special guides, this "articulated wall" slides round and back, by power or manually, alongside one of the side walls of the hangar, thus taking up the absolute minimum amount of useful space.

These doors can, if necessary, be filled with ballast to give protection against bomb splinters.

Simplifix Couplings, Ltd. (Stand 48), 3, Victoria Street, London, S.W.1.—Pipe joints for all kinds of pipes and tubes which may be of interest to the aerodrome owner for use in laying out his lines for water, compressed air and other supply services, and fittings which he may find it necessary to stock as spares for use in aircraft, are displayed on this stand.

These couplings are all subject of British patent No. 378,898, and are for sizes of tube varying from ¼in. to 2in. The display includes couplings made in brass, steel, stainless steel and duralumin, and as used for copper, Tungum, steel, duralumin and light-alloy tubes, such as are now supplied to the aircraft industry.

A particular advantage claimed for this patent type of coupling is that the tube is not expanded and thus weakened and the joint is made by simply tightening up a nut with a spanner, no special tools or expanders being required. Joints are displayed in straight unions, elbows, tees, Y-pieces, etc.

Standard Telephones and Cables, Ltd. (Stand 39), Connaught House, Aldwych, London, W.C.2.—Four items of radio equipment are shown. First is an omni-directional radio beacon (135 watt), for aerodrome, coastal station or lightship use. The frequency range is 350-240 kc/s. (857-1,250 metres), and it is entirely automatic in operation. Easily recognisable coded signals can be sent out at desired intervals, periods between transmissions being controlled by a chronometer. The equipment may be operated as a beacon or as a straightforward telephone-telegraph transmitter.

There is crystal or auto-oscillator control of frequency and completely self-contained power equipment for operation from A.C. mains (operation from D.C. mains is by rotating machines). A wall-mounted fault-indicator unit gives visual and aural indications.

Secondly, there is a highly sensitive seven-valve superheterodyne long-wave receiver for marine, aerodrome or other land services. The frequency range is 1,200-75 kc/s. (250-4,000 metres), and the complete frequency range is covered without coil changing.

Aerodrome building paints are featured at the exhibition by Titanine, Ltd. A view in the firm's despatch department. (Stand 40.)

Complete A.C. operation from separate power supply unit is provided, with switching for operation from batteries in cases of emergency.

Thirdly is shown the R.5 short-wave receiver (eight-valve superheterodyne) for radio link use, rebroadcasting, aerodrome ground stations and similar purposes. The frequency range is 22.2-1.2 Mc/s (13.5-250 metres). Power supplies are taken from batteries or from special A.C. mains unit.

Lastly, there is the well-known R.4 Standard-Adcock direction finder, giving freedom from "night effect" and "aeroplane error." The frequency range is D/F: 167-375 kc/s. (1,800-800 metres); traffic: 60-1,200 kc/s. (5,000-25 metres). Separation of aerial system and receiving apparatus may be as great as 3,250ft.

L. Steiner (Stand 13), Stenorizer Works, Kew Foot Road, Richmond, Surrey.—Visitors to this stand will find the Stenorizer, an interesting little electrically operated machine. It is claimed to be unrivalled for the repairing of fire hose, canvas, rubber sheeting and allied materials. The equipment has been thoroughly tested, and it is stated that repairs, in the case of fire hose, have been found to withstand pressures far in excess of normal conditions.

Simplicity is the keynote of operation, and there is no danger of damage to articles being repaired as the heat is controlled automatically. The performance of the machine is rapid and economical and current consumption is negligible, being approximately 60 repairs per unit.

The Stenorizer, it is claimed, has completely revolutionised vulcanising and is finding a place in many business houses apart from thousands of garages and service stations. It is being supplied to the Admiralty, the Post Office, railway companies and many fire brigades throughout the country. Its utility to A.R.P. stations is also being recognised.

Stream-Line Filters, Ltd. (Stand 28), Hele-Shaw Works, Ingate Place, London, S.W.1.—"Good oil does not wear out," says this company, and they have put that fact to good use by developing equipment for cleaning used oil. It is now their claim that over 6,000 large Stream-Line filters were in use by the end of 1937, dealing with more than 60 million gallons of used oil per annum. Extensive repeat orders have been executed for the Air Ministry and other Government departments, and it is stated that over 60 per cent. of the bus operators in Great Britain use these filters.

The apparatus is simple in principle, consisting essentially of a special filter element, a means of heating the oil and the provision of a compressed-air supply. After several hours of filtering, the element is almost instantaneously cleaned of sludge by a process in which the compressed air, flowing through the filter in the opposite direction, takes the place of the oil.

A wide choice of sizes and types is available, and four typical equipments are being exhibited.

Sutton and Sons, Ltd. (Stand 24), The Royal Seed Establishment, Reading.—In this exhibit are to be seen specimens of the various plants which contribute to the formation of aerodrome turf, shown as single species and growing in mixture. The specimens include turfs produced from prescriptions supplied for the sowing down of well-known landing grounds.

Seed-testing and soil examination are among the many other subjects demonstrated, and the important question of grass drying as a profitable means of disposing of cuttings is also touched upon.

This firm has specialised in turf production for nearly a century, and has a reputation second to none in this connection. Experts on all matters relating to turf formation and maintenance will be in attendance.

Tecalemit, Ltd. (Stand 9), Great West Road, Brentford, Middlesex.—The Tecalemit exhibit consists of the following items:—

Tecalemit "Boomerang" refuelling and defuelling tanker, Mark II, a mobile unit designed for the filling and emptying of fuel tanks and incorporating Tecalemeter accurate measurement of the liquid dispensed. Efficient safety devices and flame arrestors of Tecalemit design are included.

Tecalemit Aerodrain, specially designed for the emptying of aircraft oil tanks and sumps: The long jointed and adjustable neck combined with the small diameter "basin" enables even the most awkwardly placed drain plug to be accommodated.

Bulk air and water eliminator for petrol, intended for employment on bulk storage and delivery equipment for airport use: Air and water elimination is carried out simply and efficiently, while pressure-gauge control gives safety in operation.

Automatic safety refuelling nozzle (Series II) to prevent overfilling of aircraft tanks and so eliminate risk of fire from spilt fuel. The nozzle is shown in operation.

Tecalemeters: These are a range of highly developed and accurate liquid meters working on the positive displacement principle. A demonstration shows the advantage of the incorporated thermostatic control. The range includes units for almost every metering requirement.

Air compressors: A wide range of single- and two-stage compressors is available. On the stand is shown an example of a very small transportable unit, whilst others are available up to 24 cu. ft./min. All stationary

units incorporate automatic cut-in and cut-out, pressure gauges and pressure control valves.

Finally, there are examples of grease guns for use on aircraft and special lightweight fittings.

Terrell's Paint and Varnish Co., Ltd. (Stand 49), Sunbeam Road, Chase Estate, Park Royal, London, N.W.10.—Though it manufactures all types of finishes for decorative and maintenance purposes, this firm is appropriately confining its exhibit to materials of interest to aerodrome builders and those responsible for maintenance, e.g., hard-gloss finishes, undercoatings, washable distemper, heat-resisting enamel, floor paint, etc.

It is emphasised that the panels shown were brush-prepared under working conditions and not in dustproof rooms, thus giving an accurate idea of results obtainable by the customer.

Thompson Bros. (Bilston), Ltd. (Stand 1), Bradley Engineering Works, Bilston, Staffs.—This exhibit will consist of a T.B. refuelling tender specially adapted for use at civil training schools, equipped with Ford 10 h.p. engine and giving three speeds forward, with reverse. The gear box has special power take-off for pumping operations. The chassis is mounted on three wheels, equipped with 24in. by 7in. high-pressure tyres. On the rear wheels are internal-expanding brakes.

Capacities are: 500 gallons for petrol in either one or two compartments; oil, 50 gallons.

The pumping equipment includes meters and air separators, with efficient filtering devices. The rate of flow is 20 gallons per minute for petrol and 4 gallons per minute for oil. Control of the deliveries is effected by hand-controlled nozzles, as both supplies are fitted with necessary relief valves and venting arrangements.

Special advantages claimed for this type of refuelling tender are: Extreme mobility, perfect stability and one-man operation, coupled with speedy refuelling.

Titanine, Ltd. (Stand 40), Colindale, London, N.W.9.—Manufacturers of all types of cellulose and synthetic finishes for industrial purposes and of the well-known Titanine doping schemes for aircraft, this firm is showing cellulose and synthetic finishes for the protection and decoration of the external and internal parts of aerodrome buildings. Examples are shown on sections of girder and galvanised-iron surfaces, illustrating primers and finishes in aluminium and also in camouflage colours. These demonstrate the use of a special Titanine primer for galvanised iron, and the well-known "Lumilac" synthetic finishes.

A range of coated wooden panels show Titanine transparent cellulose wood finishes, suitable for the decoration of offices, etc.

Wood and metal panels illustrate Titanine synthetic finishes in various colours, and different types of panelling in asbestos, Masonite, etc., show special schemes of decoration for these various surfaces.

Titanine doping schemes in silver, training yellow and camouflage colours are shown on sample panels of fabric, wood and metal.

The stand is equipped with steel furniture coated with Titanine lacquer.

AERODROME EQUIPMENT MAKERS

A Brief Review of the Products of Some Other Firms, Not in the Exhibition, of Interest to the Aerodrome Operator

Index: p. 123.

AIRCO, LTD., Eagle House, 109, Jermyn Street, London, S.W.—These well-known aviation factors list a good deal of aerodrome equipment, including Tilley portable floodlights.

AIRCRAFT COMPONENTS, LTD., Cheltenham.—Though best known for their undercarriage equipment, Aircraft Components also make ground equipment items in which their extensive knowledge of hydraulic engineering is put to good use; inflation pumps are among these products.

BELL'S ASBESTOS AND ENGINEERING SUPPLIES, LTD., Slough, Bucks, are makers of "Bestobell" Air Ministry pattern fire rescue clothing, and also of isolation screens for the protection of aircraft in hangars in the event of fire.

LEWIS BERGER AND SONS, LTD., Homerton, London, E.9, are makers of finishes of all kinds, including paints especially suitable for airport building decoration and protection.

BRADSHAW BROS. (CONTRACTORS), LTD., 214, Blackbird Road, Leicester, are aerodrome and landing-ground contractors and have been responsible for a large number of aerodromes in Great Britain; they are also patentees of a system of gravel-filled drainage, used in Air Ministry contracts.

BRITISH OXYGEN CO., LTD., Thames House, Millbank, S.W.1.—The two B.O.C. specialities coming under the heading of aerodrome equipment are nitrogen tyre inflation apparatus and "Alda" oxy-acetylene welding outfits. Nitrogen, which has a number of notable advantages for tyre inflation purposes, is provided in cylinders, portable and for workshop installation, and there is a full range of tyre-filling equipment.

J. B. CARR, LTD., Tettenhall, Staffs.—This firm undertakes speedy preparation of landing grounds, using modern methods. Their scope includes levelling, draining, tree clearance, and turfing.

CELLACTITE AND BRITISH URALITE, LTD., Lincoln House, 296-302, High Holborn, London, W.C.1.—Best known of this firm's products is Cellactite, an asbestos-protected material for roofing and walling aircraft hangars, etc. Advantages claimed for Cellactite include great strength, resistance to corrosion, low weight, economy, easy fixing, and temperature-insulating qualities.

Next, there is the Cellactite Medway ventilator for securing air movement within buildings. It is uniform in quality with Cellactite.

Thirdly, the firm makes Uralite, a sheeting material made almost entirely of pure asbestos fibre. Hard or soft sheets are provided.

Lastly, there is Kimoloboard, a new fireproof panelling board composed of asbestos fibre and diatomaceous earth. It carries the B.S.I. certificate of incombustibility and has been proved to resist, in half-inch thickness, even thermite incendiary bombs.

CHLORIDE ELECTRICAL STORAGE CO., LTD., Clifton Junction, Manchester.—These famous battery makers also manufacture a ground starting trolley for use on aerodromes. Another Exide speciality of interest to aerodrome owners is the Keepalite emergency lighting system.

CLARKE, CHAPMAN AND CO., LTD., Gateshead, Co. Durham, are makers of aerodrome lighting equipment, including complete searchlight and cloud-height projectors.

CLEVELAND BRIDGE AND ENGINEERING CO., LTD., Darlington, are erectors of hangars and steel buildings, and supply Eclair counter-balanced doors for hangars and factories.

COLAS PRODUCTS, LTD., Norman House, 105-109, Strand, London, W.C.2, have for several years made a special study of the uses of their cold bituminous emulsions for the construction of various types of artificial surfaces on aerodromes. Expert Colas engineers are now available in all parts of the world to advise on the surfacing of aprons, runways, hangar floors, service roads, etc.

Methods of treatment vary from the cheap stabilisation of natural surface aggregate for light traffic, to pre-mix or grouted construction for really heavy service, but in every case the emulsion is used cold as it is received, and no expensive plant or equipment is required.

At Hattie's Camp, Newfoundland—a vital link in the proposed Atlantic Air Service—an enormous area is now being surfaced with a two-coat cold asphalt, using a semi-stable emulsion of the Colasmix type which is being manufactured locally. In addition to the work in progress in Newfoundland, examples of Colas surfaces are to be seen in this country and other parts of the world, typical examples being Southampton, Doncaster, Exeter, St. Hubert Airport in Canada and Samaden, Switzerland, the highest airport in Europe.

COMMERCIAL STRUCTURES, LTD., Staffa Road, Lea Bridge Road, London, E.10, provide a comprehensive service for those undertaking any kind of building work; their activities include structural steel engineering, reinforced concrete design and construction, heating and ventilating engineering, machinery installation, etc. Any single part of such service may be used, or, on the other hand, the firm can undertake the whole of any building project.

CRIMBLE OF STAINES, Kingston Road, Staines, supply Fordson tractors for aerodrome maintenance and construction (wheeled or roadless track models), mobile cranes on pneumatic front wheels with roadless track, and 27ft. loading space articulated aircraft carriers powered by Fordson Commercial. They are contractors to the Air Ministry.

DIAGRID STRUCTURES, LTD., Horseferry House, London, S.W.1, specialise in long-span Diagrid floors and roofs, offering minimum structural depth and unobstructed roof space, at economic cost, in structural steel work or reinforced concrete.

B. DIXON-BATE, Bridge Works, Chester.—The speciality of this firm, in so far as aerodrome equipment is concerned, is a self-contained flashing neon beacon for land or water; it is battery operated.

DOCKER BROTHERS, LTD., Ladywood, Birmingham, are in a position to supply every type of paint for the decoration and protection of airports.

For the camouflage of aerodrome buildings, runways, and aprons, two types of finishes can be supplied, namely, a matt synthetic paint for the more permanent finish, or a water paint where cost is of first consideration.

There is a wide range of finishes for the interior or exterior decoration of airport buildings. "Hermator" high-gloss paints form an excellent medium for decoration and preservation of wood or metal, while for the highest class of finish "Syntholux" synthetic finishes can be obtained in a wide range of colours and surfaces.

"Almega" washable water paint is supplied in most colours.

"Stopstara" glazing compound for steel and metal windows, casements, and lights affords a permanently efficient method of glazing modern buildings.

ECLAIR DOORS, LTD., Priory Works, Shirley, Birmingham, are makers of Eclair balanced doors up to 250ft. wide, giving unobstructed opening when raised.

EDISON SWAN ELECTRIC CO., LTD., 155, Charing Cross Road, London, W.C.2, produces Royal Ediswan Escura electric discharge lamps; Royal "Ediswan" incandescent electric lamps; and "Ediswan" lighting equipment. A lighting engineering section provides technical advice.

ELLIOT BROS. (LONDON), LTD., Century Works, Lewisham, London, S.E.13.—In addition to the recording and testing equipment which they make, this firm produces an aircraft position indicator and a windspeed and direction indicator. The former, an ingenious device evolved in conjunction with the Air Ministry, consists of sixteen pairs of

AERODROME EQUIPMENT MAKERS (CONTINUED)

endless perforated steel tapes driven by a synchronous motor and moving at different speeds representing between 100 and 400 km.p.h. Each tape represents a route length of 350 km., and carries one or more light-coloured metal tabs, attached magnetically at any required point to represent an aircraft travelling on that route at the appropriate speed. The control officer thus has visual indication of the progress of an almost unlimited number of aircraft, while an auxiliary device records the height at which each machine is travelling.

The wind-speed recorder provides an electrical method recording the true wind speed and direction, and has particular value for guidance when launching ship-borne aircraft by catapult or similar other means.

G. ELLIS AND CO., Eagle Wharf, Eastway, London, E.9, are specialists in easily erected portable buildings, hangars for gliders, light aircraft, etc., and buildings suitable for C.A.G. accommodation.

THE EN-TOUT-CAS CO., Syston, Leicester, specialises in the construction of landing grounds and all works connected therewith, such as tree and hedge clearance, land drainage, etc. In addition, the company has, during the past few years, done a great deal of specialised building work in connection with aerodromes, and have a large organisation which allows them to get the work through quickly. The company has carried out a considerable amount of building work at various Reserve training school establishments, notably the Bristol School at Yatesbury, and the Reid and Sigrist establishment at Desford.

ARTHUR L. GIBSON AND CO., LTD., Radnor Works, Twickenham, Middlesex.—Kinnear patent rolling steel shutters for hangars, factories, and similar purposes are the speciality of this firm. Their shutters are used on the aircraft hangars of certain cruisers and aircraft carriers of the Royal Navy, and have recently been installed at the Kidbrooke Balloon Barrage Depot.

HADFIELDS (MERTON), LTD., 131, Western Road, Mitcham, Surrey, are manufacturers of all types of lacquers, varnishes, and paints.

HAMMOND PUMP AND EQUIPMENT CO., LTD., Kingsbury Works, Kingsbury Road, London, N.W.9, are makers of petrol, fuel oil, and lubricating oil metering pumps for aerodromes, electrically operated.

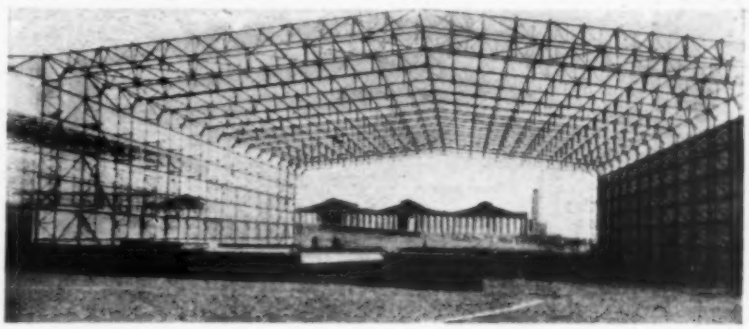
HARVEY FROST AND CO., LTD., Bishop's Stortford, Herts, specialise in tyre servicing equipment.

HEAD, WRIGHTSON AND CO., LTD., Thornaby-on-Tees.—An interesting produce of this firm is the Bellman hangar, which is made up in units built of mild steel rolled sections. It is light in weight and easily removed from one site to another. It is stated that the Air Ministry has made the Bellman transportable hangar its standard type in this class. It can be erected in sizes up to 95ft. span by 25ft. high, and up to any length; covering is either by canvas or by galvanised sheets.

HORSELEY BRIDGE AND THOS. PIGGOTT, LTD., Tipton, Staffs, produce "Lamella" patented steel roof construction for hangars and all buildings having large clear spans; they are also responsible for structural steelwork of various kinds.

JAMES HUNTER, LTD., better known as Hunters of Chester, claim the distinction of having created a new dictionary word—that of "hunterising" aerodromes. A hunterised aerodrome implies a surface of billiards table solidity and smoothness (not necessarily "levelness," but with drainage contours blending smoothly one into another) no matter what state of knobbliness existed before the site was assailed.

The gauge of smoothness is Mr. C. P. Hunter's car. It must do 50 m.p.h. in comfort over the aerodrome before he is satisfied. Indeed, 75 m.p.h. has been attained on Westland's Yeovil aerodrome, the latest contract executed by them. A speciality of the firm is the making of flyable surfaces on airports within six months of starting. If the season is unfavourable for turf production, the semi-hunterised surface, which is a preliminary, serves quite adequately for flying purposes, except in downpours of rain.



A Bellman hangar (Head, Wrightson and Co., Ltd.) in course of erection.

JAMES A. JOBLING AND CO., LTD., Wear Glassworks, Sunderland, are makers of boundary-light lenses, wireless insulators, floodlight lenses, and neon tubing.

ROBERT KEARSLEY AND CO., Ripon, Yorks.—Apart from their "Nulac" synthetic resin varnishes and enamels for aircraft (described in an attractive new catalogue recently issued), this firm makes finishes of particular interest to the aerodrome operator, e.g., factory floor paint, white-line paint, and special paint for A.R.P. purposes.

A. AND A. J. LAW, LTD., Runnymede Steel Works, Merton Abbey, London, S.W.19, are makers of steel-framed hangars, administrating blocks, control towers, workshops, etc.

LEWIN ROADSWEEPERS, LTD., Crossens, Southport, Lancs.—A very useful item of equipment to have about an aerodrome and its maintenance shops is the Lewin universal sweeper and collector, as supplied to the Air Ministry and other Government departments. Driven by a 2½ h.p. two-stroke engine, it has a large rotary brush (3ft. to 5ft. wide), water tank and sprinkler, and tipping collector box of 3½ cu. ft. capacity.

LINDSAY-NEALE AVIATION, LTD., 4, Park Lane, London, W.1, supply all types of aerodrome equipment, their latest product being special aerodrome boundary markers of the approved type, of all-steel construction. These can be produced very economically and are more durable than those made of wood. The following are also supplied: Hangars in steel and timber, fire extinguishers of all types for aircraft and aerodromes, crash-gear and equipment to Air Ministry specifications, aerodrome fencing, aerodrome indicators, and wind-stockings, masts, etc.

Another speciality of the company is the Lindsay-Neale crash-tender, designed to carry all the crash-gear and fire equipment specified by the Air Ministry in A.M. Pamphlet 55, Appendix IIIb. This trailer has been adopted as standard by many aerodromes throughout the country.

LLEWELLYN RYLAND, LTD., Balsall Heath Works, Birmingham, 12.—Among the products of these paint specialists are protective finishes for steel structures, offices, and stores, both for interior and exterior work. The chief of these products are: (1) "Rubrox," a rubber paint which forms an exceedingly elastic film of extreme durability and high protective value for the coating of steel structures. (2) "Ardak" synthetic finish for steel structures. The method of application is one coat of "Kromox" primer followed by "Ardax" silver finish or any required shade. (3) "Rhelglos" high-gloss paint for inside and outside decoration. (4) "Ogloso" superfine white enamel for office and passage walls, etc.; it is also supplied in colours. (5) "Velvard" velvet wall paint—an outstanding new wall finish. (6) "Priorite" oil-bound washable water paint.

LLOYDS AND CO. (LETCHWORTH), LTD., Letchworth, Herts, are makers of aerodrome grass-cutting equipment, including units ganged up in teams of from five to eleven. They also produce the "Auto-scythe" for cutting of weeds, etc., in rough corners.

JOHN LYSAGHT, LTD., Netham, Bristol.—This firm supplies and erects constructional steel work for aerodromes, factories, etc.

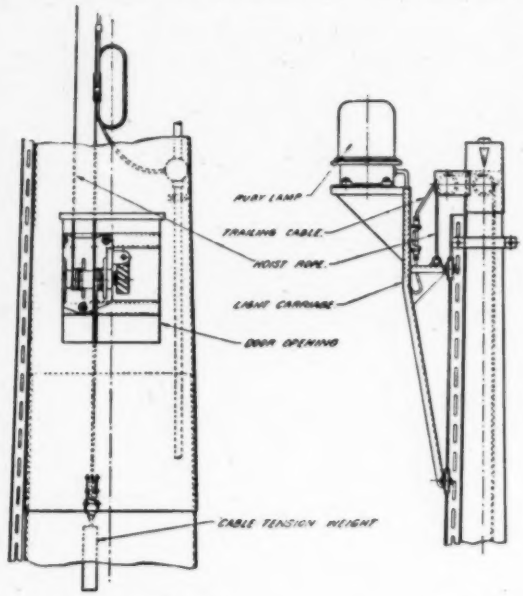
MARTIN-BAKER AIRCRAFT CO., LTD., Higher Denham, nr. Uxbridge, are manufacturers of the Martin-Baker wind direction indicator.

NISSEN BUILDINGS, LTD., Rye House, Hoddesdon, Herts, erect factories and extensions, hangars, shops, stores, canteens, cycle sheds, air-raid shelters, etc.

NOBEL CHEMICAL FINISHES, LTD., Nobel House, Buckingham Gate; London, S.W.1.—In addition to being approved suppliers of all types of aircraft finishes to Air Ministry specifications, Nobel Chemical Finishes, Ltd., can also supply a wide range of main-

The Lewin universal sweeper (Lewin Roadsweepers, Ltd.).

AERODROME EQUIPMENT MAKERS (CONTINUED)



(Above) The new Rotax starter truck. It is described below.

(Left) Details of the obstruction-light tower developed by Poles (1938) Ltd. and described on this page.

tenance paints for aerodrome and other buildings, and finishes for all types of aerodrome equipment. Special attention has been given to the development of paint for camouflaging aerodromes, factories, etc., and technical advice can be given on all camouflage problems.

NORTHERN ALUMINIUM CO., LTD., Bush House, Aldwych, London, W.C.2.—A product of this firm of alloy specialists is "Noral" aluminium paste, an important ingredient of aluminium paints for preservative and decorative purposes.

PAK PARACHUTE CO., LTD., 175a, Streatham Road, Mitcham, Surrey, are makers of wind indicators, wind cones, signal cones, aerial kites, and allied ground equipment for aerodromes.

POLES (1938), LTD., Nickel Works, Erdington, Birmingham.—The accompanying drawing gives details of a new tower for mounting aerodrome obstruction lights. It is the result of much experimental work by this company, with the collaboration of the Air Ministry. Mounting heights of over 200ft. can be attained, and guying or staying is entirely eliminated. The structure is made up of tapered sections, hot-spelter-galvanised inside and out, and strained together to a glove-like overlapping fit, as in the other well-known varieties of "Adastra" poles.

The winding gear and conductor are housed inside the pole itself, and are completely weatherproof. The raising and lowering of the light is effected by means of a travelling platform with phosphor-bronze wheels, operating on a guide rail of galvanised tee section. No drilling, riveting, or welding is necessary on erection. The drawing is of an actual pole erected at Croydon for the Air Ministry.

PYRENE CO., LTD., Great West Road, Brentford.—These well-known manufacturers of fire extinguishers list a variety of fire-fighting equipment specially suitable for aerodromes, ranging from small hand extinguishers to trailer-type fire engines; foam equipment is a speciality.

RADIO TRANSMISSION EQUIPMENT, LTD., 45, Nightingale Lane, Balham, London, S.W.12, are contractors to all Government Departments. They are manufacturers of aircraft radio equipment, including homing receivers, navigational beacons and beacon receivers for blind landing; aircraft standard transmitters of 50 and 100 watts output on long and short waves; marine equipment, including D/F gear, navigational beacons, all-wave receivers and ship transmitters.

RANSOMES & RAPIER, LTD., Ipswich and London, are makers of Rapier mobile cranes with rubber-tyred road wheels for aerodrome and hangar service. The cranes are petrol-electric or Diesel-electric, and are made in four types each, to lift loads from 1 to 6 tons.

At the present stage catapult launching hardly enters into the sphere of aerodrome operation, but it is worth noting that the famous Rapier catapults are made for land as well as marine use.

A recent Rapier development is the Rapier-Irvine heat-treatment machine for soil road construction. This machine, travelling over virgin soil, leaves in its wake a trail of broken-brick-like material which, when consolidated by rolling, has the general characteristics of a good gravel road.

RANSOME, SIMS AND JEFFERIES, LTD., Orwell Works, Ipswich, are manufacturers of machinery for preparation and maintenance of aerodromes, i.e., gang-mowers specially designed for cutting aerodromes, mole-drainers, disc harrows, drag harrows, and land levellers. They also make transportable hangars, etc.

REID AND SIGRIST, LTD., Shannon Corner, Kingston By-pass, New Malden. — This famous firm of aeronautical instrument makers also make two items of interest to aerodrome owners—a folding 12ft. carbon-steel grab-hook for fire rescues (with an extension cable enabling a number of helpers to assist in the pulling), and, secondly, an aircraft picket of a novel type; in this, two picket rods are coupled together at right angles by a cross-piece; one picket is first driven into the ground at an angle of 45 degrees, sliding, through the cross-piece; the other is then driven into the ground at right angles to the first. High resistance to a pull from any direction is the result.

R.F.D. CO., LTD., 17, Stoke Road, Guildford, Surrey.—This firm of balloon and flotation gear specialists also make such aerodrome equipment as wind socks, including an illuminated type.

ROTAX, LTD., Willesden Junction, London, N.W.10.—Rotax equipment for aerodromes consists of two items, the Rotax-Harley portable floodlight and the Rotax motor starter truck. The former consists of a single 11in. 250-watt Harley lamp adjustably mounted on top of a 5ft. pedestal on a robust three-wheel truck carrying storage batteries and a petrol-driven generator.

The starter truck has been designed to provide a source of power for aircraft engine electric starters, either at the flying field or in engine test houses. By merely plugging into the ground starting socket and by pressing a button, the engine can be cranked over, and this process can be repeated on any number of engines without any fear of discharged batteries.

The equipment consists essentially of a double-wound transformer, a full-wave bridge-connected Selenium metal rectifier, and a starting and overload protection contactor, push-button controlled, also a series parallel switch to enable alternative outputs of 12 volts 300 amperes, or 24 volts 150 amperes. The truck is designed, if required, to be operated on overloads up to 100 per cent. for periods of five minutes, provided that intervals of ten minutes are allowed for the equipment to cool down.

SELF-PRIMING PUMP AND ENGINEERING CO., LTD., Edinburgh Avenue, Trading Estate, Slough, are makers of petrol pumps of all types, including electrically driven remote unit pumps.

ALEXANDER SHANKS AND SON, LTD., 66, Victoria Street, London, S.W.1, make gang-mowers with special cutting cylinders for maintaining grass landing areas, and also produce motor and hand mowers of all types.

SQUARE-GRIP REINFORCEMENT CO., LTD., Windmill Road, Sunbury, and Team Valley Trading Estate, Gateshead, specialise in reinforced concrete hangar floors, walls and roofs, concrete roadways, aprons, runways, etc.

STRAIGHT CORPORATION, LTD., 17, Manchester Square, London, W.1.—Apart from being operators of a number of airports on behalf of municipal authorities, Straight Corporation act as aeronautical consultants in all branches of civil and military aerodrome siting, layout, zoning, construction, and management.

B. SUNLEY & CO., LTD., Sunley's Island, Great West Road, Brentford, Middlesex, are aerodrome contractors for construction, extension, and maintenance. They possess a great deal of modern plant and machinery, and their organisation includes an immense fleet of more than 100 tractors with scrapers up to 12 cubic yds. capacity, 80 of the latest-

type excavators, and over 300 lorries and dumpers.

TROUGHTON AND YOUNG, LTD., 143, Knightsbridge, London, S.W.1.—On the Air Ministry list, this firm are contractors for electrical installations and wiring at aerodromes, factories, etc.

VALOR CO., LTD., Bromford, Erdington, Birmingham, 24.—Specialists in steel storage equipment, this firm makes a large variety of lubricating apparatus and oil storage equipment, both in portable and fixed types, together with measures, funnels, etc. They supply, too, steel lockers, storage bins, and steel office furniture. The Valor Co. is also responsible for a range of fire extinguishing equipment.

WAYNE TANK AND PUMP CO., LTD., Newlands Park, London, S.E.26, specialise in pumps and tanks for petrol and oil. Wayne pumps, it is stated, are installed at Croydon, Heston, Portsmouth, Carlisle, Exeter, and Brough.

A further development of the company's activities is the design and installation of complete petrol and oil system for engine and airscrew test beds. They have recently installed a plant at the De Havilland works, and have another in hand at the new Rolls-Royce factory at Crewe.

EDWARD WEBB AND SONS (STOURBRIDGE), LTD., Stourbridge, Worcestershire.—This firm is seed specialists and fertiliser manufacturers, and undertake aerodrome site inspection and soil analysis, and give recommendations for grass-seed mixtures

WRIGHT, ANDERSON AND CO., LTD., Gateshead-on-Tyne, supply and erect structural steel work for all purposes. Clear spans up to 200ft. are designed, fabricated, and erected at home or abroad.

ZWICKY, LTD., Slough, Bucks, are makers of aerodrome mobile refuelling units and allied equipment.

INDEX TO SUPPLIERS

Firms Dealt with in the Foregoing Reviews : A Classified Guide

Aerodrome Construction, Seeding, Drainage and Maintenance (including Equipment and Materials)

Exhibitors.—British Bitumen Emulsions, Ltd.; Halder Construction, Ltd.; Sutton and Sons, Ltd.

Non-exhibitors.—Bradshaw Bros. (Contractors), Ltd.; J. B. Carr, Ltd.; Colas Products, Ltd.; Commercial Structures, Ltd.; Crimble of Staines; En-Tout-Cas Co., Ltd.; Hunter, Ltd., James; Lewin Roadsweepers, Ltd.; Lloyds and Co. (Letchworth), Ltd.; Ransomes and Rapier, Ltd.; Ransome, Sims and Jefferies, Ltd.; Shanks and Son, Ltd., Alexander; Square-Grip Reinforcement Co., Ltd.; Straight Corporation, Ltd.; Sunley and Co., Ltd., B.; Webb and Sons (Stourbridge), Ltd.

Buildings, Interior Equipment and Building Materials (including Paints)

Exhibitors.—Ash's Mfg. Co., Ltd.; B. B. Chemical Co., Ltd.; Boulton and Paul, Ltd.; British Unit Heater and Radiator Co.; Callender's Cable and Construction Co., Ltd.; Cellon, Ltd.; Esavian Doors; Hall and Sons (Bristol and London), Ltd., John; Hydran Products, Ltd.; London and Midland Steel Scaffolding Co., Ltd.; Mopin and Co., Ltd.; Silent Gliding Doors, Ltd.; Simplifix Couplings, Ltd.; Stream-Line Filters, Ltd. Terrell's Paint and Varnish Co., Ltd.; Titanine, Ltd.

Non-exhibitors.—Berger and Sons, Ltd., Lewis; Cellactite and British Uralite Ltd.; Cleveland Bridge and Engineering Co., Ltd.; Diagrid Structures, Ltd.; Docker Bros., Ltd.; Eclair Doors, Ltd.; Ellis and Co., G.; En-Tout-Cas Co.; Gibson and Co., Ltd., Arthur L.; Hadfields (Merton), Ltd.; Head, Wrightson and Co., Ltd.; Horseley Bridge and Thos. Piggot, Ltd.; Kearsley and Co., Robert; Law, Ltd., A. and A. J.; Lindsay-Neale Aviation, Ltd.; Llewellyn Ryland, Ltd.; Nissen Buildings, Ltd.; Northern Aluminium Co., Ltd.; Square-Grip Reinforcement Co., Ltd.; Wright, Anderson and Co., Ltd.

Fire-fighting and Rescue Equipment

Exhibitors.—General Fire Appliance Co., Ltd.; Kidde Co., Ltd., Walter; National Fire Protection Co. Ltd.

Non-exhibitors.—Bell's Asbestos and Engineering Supplies, Ltd.; Lindsay-Neale Aviation, Ltd.; Pyrene Co., Ltd.; Reid and Sigrist, Ltd.; Valor Co., Ltd.

Maintenance and Servicing Equipment, Aircraft

Exhibitors.—Aerograph Co., Ltd.; Air Industrial Developments, Ltd.; Barrus, Ltd., E. P.; B.E.N. Patents, Ltd.; Bradbury and Sons, Ltd., Joseph; Brown Brothers, Ltd.; Desoutter Bros, Ltd.; Epco, Ltd.; Erlach, Ltd., Kurt; Henley's Telegraph Works Co., Ltd., W. T.; Lake, Ltd., Ernest; London and Midland Steel Scaffolding Co., Ltd.; Morris and Ingram; Mosers, Ltd.; Newton Bros.; Pillin, John B.; Steiner, L.; Stream-Line Filters, Ltd.; Tecalemit, Ltd.; Thompson Bros. (Bilston), Ltd.

Non-exhibitors.—*[Note: Considerations of space make it necessary to confine this section to firms strictly concerned with aerodrome equipment. To enumerate the scores of concerns making workshop machinery and equipment is unfortunately impossible; readers are referred to the recent British Aircraft Industry Number of* FLIGHT *(Nov. 3, 1938).]*—Aircraft Components, Ltd.; British Oxygen Co., Ltd.; Chloride Electrical Storage Co., Ltd.; Crimble of Staines; Harvey Frost and Co., Ltd.; Lewin Roadsweepers, Ltd.; Ransomes and Rapier, Ltd.; Reid and Sigrist, Ltd.; Rotax, Ltd.; Valor Co., Ltd.

Lighting, Electrical Equipment, and Wind Indicators

Exhibitors.—British Thomson-Houston Co., Ltd.; Brown Brothers, Ltd.; Butlers, Ltd.; Callender's Cable and Construction Co., Ltd.; Cardiff Foundry and Engineering Co., Ltd.; Chance Bros. and Co., Ltd.; General Aircraft, Ltd.; General Electric Co., Ltd.; Henley's Telegraph Works Co., Ltd., W. T.

Non-exhibitors.—Airco, Ltd.; Clark, Chapman and Co., Ltd.; Dixon-Bate, B.; Edison Swan Electric Co., Ltd.; Jobling and Co., Ltd., James A.; Lindsay-Neale Aviation, Ltd.; Martin-Baker Aircraft Co., Ltd.; Pak Parachute Co., Ltd.; Poles, Ltd.; R.F.D. Co., Ltd. Rotax, Ltd.; Troughton and Young, Ltd.

Meteorological and Control Equipment

Exhibitors.—Short and Mason, Ltd.

Non-exhibitors.—Elliot Bros (London), Ltd.; Pak Parachute Co., Ltd.; R.F.D. Co., Ltd.

Miscellaneous (Agents, etc.)

Non-exhibitors.—Airco, Ltd.; Lindsay-Neale Aviation, Ltd.

Radio

Exhibitors.—General Aircraft, Ltd.; Marconi's Wireless Telegraph Co., Ltd.; Plessey Co., Ltd.; Standard Telephones and Cables, Ltd.

Non-exhibitors.—Radio Transmission Equipment, Ltd.

Refuelling Equipment

Exhibitors.—Brown Brothers, Ltd.; Pillin, John B.; Tecalemit, Ltd.; Thompson Bros. (Bilston), Ltd

Non-exhibitors.—Hammond Pump and Equipment Co., Ltd.; Self-Priming Pump and Engineering Co., Ltd.; Wayne Tank and Pump Co., Ltd.; Zwicky, Ltd.

Forthcoming Events

FEBRUARY.

Wed.—Fri., 1st—3rd. Aerodrome Owners' Association: Airports Conference and Exhibition.

Wed. 1st. R.U.S.I. Lecture: "Air Co-operation," by Group Capt. A. J. Capel, D.S.O., D.F.C.

Thurs., 2nd. R.Ae.S. Yeovil Branch Lecture: "Steel Manufacture," by J. G. Hopcraft, M.C., A.M.I.Ae.E.

Tues., 7th. R.Ae.S. Joint Lecture with I.A.E. and others: "Sleeve-Valve Engines," by A. H. R. Fedden, D.Sc., M.B.E., M.I.A.E., M.S.A.E., F.R.Ae.S.; Institution of Mechanical Engineers, 7.45 p.m.

R.Ae.S. Belfast Branch Lecture: "Testing Prototypes," by J. Lankester Parker, A.F.R.Ae.S.

Wed., 8th. Lecture by R. Kronfeld: "Gliding and Soaring." Royal Society of Arts, John Street, London, W.C.2., 8.15 p.m.

Thurs., 9th. R.Ae.S. Portsmouth Branch Lecture: "Atlantic Crossings by Empire Boat," by Capt. A. S. Wilcockson.

Fri., 10th. Lancashire Aero Club: Annual Dance, Grand Hotel, Manchester.

Tues., 14th. R.Ae.S Students' Section Lecture: "Ignition," by F. R. F. Ramsay.

R.Ae.S. Isle of Wight Branch Lecture: "Past, Present and Future in Aviation," by Sir Alliott Verdon-Roe, O.B.E., M.I.Ae.E., F.R.Ae.S.

Thurs., 16th. R.Ae.S. Lecture*: "Ignition Problems," by Dr. G. E. Bairsto, M.I.E.E., F.Inst.P.

Manchester Civil Air Guards: Dance, Sale Lido, 7.30 p.m.

Fri., 17th. Cinque Ports Flying Club: Annual Dinner and Dance, Majestic Garden Hotel, Folkestone.

Sat., 18th. Rugby: R.A.F. v. Royal Navy at Twickenham.

Fri., 24th. York and Leeming Flying Club: Annual Ball, Harrogate.

D.H. Technical School: Annual Ball, Hyde Park Hotel, Knightsbridge, 9 p.m.

Tues., 28th. Hampshire Aeroplane Club: Annual Dinner and Dance, South Western Hotel, Southampton.

MARCH.

Thurs., 2nd. R.Ae.S. Lecture*: "Testing Stability and Control," by Ing. A. G. von Baumhauer.

Thurs., 16th. R.Ae.S. Lecture*: "Relative Merits of Carburetters and Direct Petrol Injection," by J. E. Ellor, F.R.Ae.S., and F. M. Owner, F.R.Ae.S.

APRIL.

Thurs., 20th. R.Ae.S. Lecture*: "Possible Steel Developments," by Dr. T. Swinden, F.R.Ae.S.

MAY.

Thurs., 4th. R.Ae.S. Lecture*: "Strength of Thin Metal Construction," by H. L. Cox.

Sat., 20th. Empire Air Day.

Thurs., 25th. R.Ae.S.: Wilbur Wright Memorial Lecture by Dr. G. W. Lewis.

JUNE.

Sat., 24th. Royal Air Force Garden Party.

JULY.

Sat. 8th.—Sun., 23rd. Brussels Aero Show.

*All these lectures take place at 6.30 p.m. at the Institution of Mechanical Engineers, Storey's Gate, London, S.W.1.

THE INDUSTRY

Napier Dividend

IT is pleasing to be able to record that after a long interval D. Napier and Son, Ltd., have resumed Ordinary share dividends, with a distribution of five per cent. The last distribution was 15 per cent. in 1930.

During the year ended September 30 Napiers nearly doubled their net profit. They are now, of course, in full production with the Dagger VIII engine.

Alvis Leonides Progress

DURING his reply to the toast of "The Firm" at the Alvis London Service Station annual dinner, held in London last week, Mr. T. G. John, chairman and managing director of the company, announced that the new 450 h.p. Alvis Leonides aero engine had commenced its flight tests, which were continuing satisfactorily. This engine was designed, produced and successfully type-tested in one day under 12 months from the date when the company was informed that such an engine was desirable.

Extra-long Alloy Extensions

AS a result of the introduction of new plant at the Northern Aluminium Company's Banbury works, it is stated, longer and larger extruded sections than have ever been available in this country are now being produced.

They are available in one piece for main wing spars and other members. In addition to permitting the production of stronger and more efficient structures, the new sections should offer considerable opportunities for manufacturing economies by the elimination of joints and the saving of labour involved in the building up of composite parts.

Britannia Lathes

IT is announced by Joshua Bigwood and Sons, Ltd., of Wolverhampton, makers of special-purpose machine tools, that they have purchased the good-will, including all drawings, jigs, tools, etc., of the general-purpose lathes made by the Britannia Lathe and Oil Engine Co., Ltd., of Colchester. These lathes range in size from 4½in. to 9in. centres and will in future be made at Bigwood's Wednesfield Road Works in Wolverhampton.

It is stated that the general design of the machines is being revised to bring them thoroughly up to date. Bigwood's will also be able to supply spare parts for all previous models of the Britannia lathe, and enquiries should be addressed to them at Wednesfield Road, Wolverhampton.

Reserve-School Expansion

MR. A. M. DESOUTTER (managing director, Airports, Ltd.), commenting on the recent reports of flooding at London's principal airports, remarks that Gatwick has experienced no trouble, and even heavy bombers have used the ground with no difficulty.

Incidentally, some figures which give a graphic idea of the vast scope of the Royal Air Force expansion scheme were disclosed at the recent annual general meeting of Airports, Ltd. When they started operating Reserve schools, on October 1, 1937, they had two schools (Gatwick and Gravesend), with a total of 24 aircraft and 10 instructors. To-day these schools have a total of 41 aircraft and 20 instructors. In addition, a school for the training of regular Royal Air Force personnel was started at Gatwick a few months ago and operates with 16 aircraft and 11 instructors, making a total of 57 aircraft and 31 instructors. Even these impressive totals are shortly to be increased, Gatwick's original number of aircraft being doubled in size and Gravesend's increased by 50 per cent. At each aerodrome, also, there will be a new school for the training of observers.

At the meeting, an operating profit of £28,894 was reported as carried to the balance sheet.

Advice on Aerodrome Problems

THREE weeks ago *Flight* announced the formation of a new company of aeronautical consultants, H. S. Broad and Partners, with offices at 93, Knightsbridge, London, S.W.1. Some further details are now available.

One of the main departments of the firm is that which deals with aerodromes and their organisation. Its chief object is to assist all authorities, bodies or persons in any way interested in civil aerodromes. The partner in charge of this section is Maj. R. H. S. Mealing, who was for so many years Chief Technical Assistant at the Air Ministry, and, as such, was responsible for all matters relating to ground organisation for civil aviation at home and abroad.

The firm is prepared, where required, to offer expert advice to existing and prospective aerodrome owners, and to act in any of the following capacities:—

(1) Agent advisers to prospective and existing aerodrome owners in their relations with Government departments; to advise them in such manner as will enable their aerodromes to comply with all regulations and requirements.

(2) Expert adviser to authorities, bodies or persons wishing to employ their own personnel.

(3) Expert adviser on what might be termed "minor planning," e.g., improvements to, and extensions of, landing ground, buildings and equipment.

(4) Expert advisers in respect of major planning, such as supplying complete plans for the establishment of an aerodrome, including the selection of sites, provision of full engineering and architectural plans for landing ground and buildings, and also advice on the equipment required.

SIR KINGSLEY WOOD looks into a Miles Master airframe on its jig during his visit to the new Phillips and Powis factory (reported on p. 99). The fuselage appears to have been modified to accommodate the new tail unit.

Congratulations

ANNOUNCED to take place at Strood, Kent, last Tuesday: The marriage of Mr. H. L. Piper, Short Brothers' test pilot, to Mrs. L. A. Chalk, daughter of Mr. and Mrs. S. H. Wenham, of Hook Green, Meopham, Kent.

Aerodromes as Food Producers

AN interesting case of one defence problem to some extent solving another was revealed in *The Farmer and Stock-Breeder* last week. Live stock farmers have for a long time been trying to reduce their dependence on imported oilcakes. At the same time, increasing alarm has been felt concerning the ever-growing acreage of good farmland—now 50,000 acres—which has been taken over for aerodromes.

Grass-drying (a storage process of mown grass for cattle food), in which agriculturists placed much faith, has not made the progress that was expected, and for a variety of reasons the method was inadequate to reap full benefit from the vast quantities of grass that have to be cut from off aerodromes.

A new method of preserving grass in a successful form has, however, been evolved at one Oxfordshire aerodrome with success. One of the first farmers to use the preserved grass has won a cup for the highest average milk yields in his county.

The Ministry of Agriculture is conducting research into the feeding value of the product, and it is said that this method of dealing with grass may well be extended to aerodromes throughout the country.